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Transactions of the New-York State Agricultural Society for the year ...

New York State Agricultural Society

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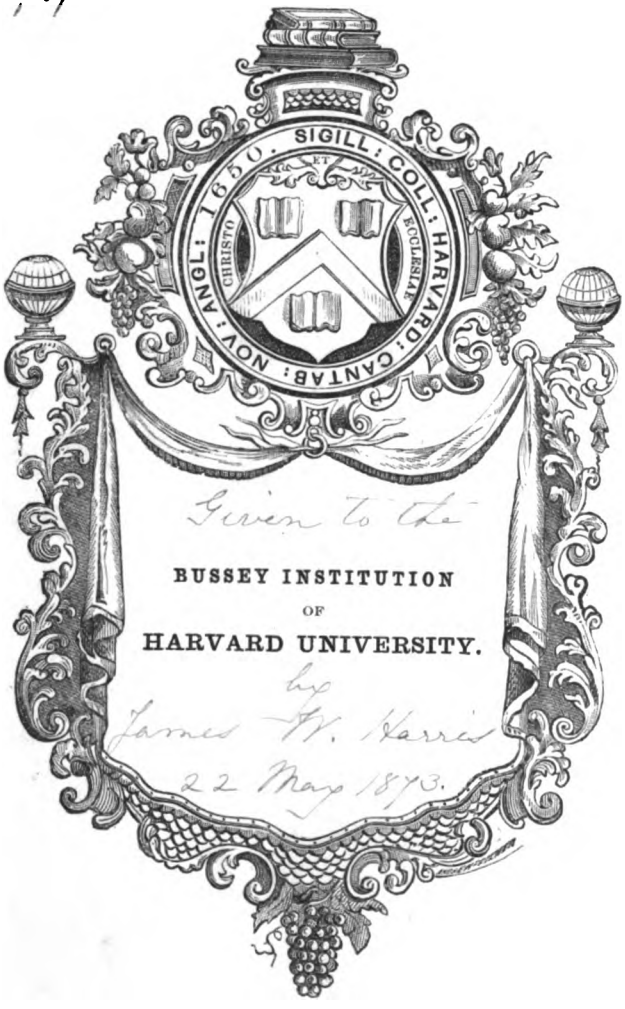

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Transactions

OF THE

NEW YORK STATE

Agricultural Society,

FOR THE YEAR

1869.

Albany.

THE ARGUS CO., PRINTERS.

1870.

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TRANSACTIONS

OF THE

New York State Agricultural Society,

WITH AN

ABSTRACT OF THE PROCEEDINGS

OF THE

COUNTY AGRICULTURAL SOCIETIES.

VOLUME XXIX—1869.

ALBANY:
THE ARGUS COMPANY, PRINTERS.
1870.

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CONSTITUTION.

The style of this Society shall be "The New York State Agricultural Society." Its object shall be to improve the condition of Agriculture, Horticulture and the Household Arts.

SECTION 1. The Society shall consist of such citizens of the State as shall signify in writing, their wish to become members, and shall pay on subscribing not less than one dollar, and annually thereafter one dollar, and also of Honorary and Corresponding members.

The Presidents of County Agricultural Societies, or a delegate from each, shall ex officio be members of this Society.

The payment of ten dollars or more, shall constitute a member for life, and shall exempt the donor from annual contributions.

SEC. 2. The officers of the Society shall consist of a President, eight Vice-Presidents, one to be located in each judicial district, a Recording Secretary, a Corresponding Secretary, a Treasurer, an Executive Committee, to consist of the officers above named and eight additional members; and five of the ex-Presidents shall be ex officio members of the Executive Committee, and these five shall consist of the five ex-Presidents whose term of office has last expired, of whom three shall constitute a quorum; and that the ex-Presidents of the Society not members of the Executive Committee, shall constitute a board of Counsellors, to whom may be referred, for consultation and advice, all questions that may from time to time arise, and in the decision of which the Society may in any manner be interested; and a General Committee, the members of which shall be located in the several counties, and be equal to the representatives in the House of Assembly.

SEC. 3. The Recording Secretary shall keep the minutes of the Society. The Corresponding Secretary shall carry on the correspondence with other Societies, with individuals, and with the General Committee, in the furtherance of the objects of the Society.

The Treasurer shall keep the funds of the Society, and disburse them on the order of the President or a Vice-President, countersigned by the Recording Secretary, and shall make a report of the receipts and expenditures at the annual meeting in January.

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The Executive Committee shall take charge of and distribute or preserve all seeds, plants, books, models, etc which may be transmitted to the Society; and shall have also the charge of all communications designated or calculated for publication, and so far as they may deem expedient, shall collect, arrange and publish the same in such manner and form as they shall deem best calculated to promote the objects of the Society.

The General Committee are charged with the interests of the Society in the counties in which they shall respectively reside, and will constitute a medium of communication between the Executive Committee and the remote members of the Society.

SEC. 4. There shall be an annual meeting of the Society on the second Wednesday of February, in the city of Albany, at which time all the officers shall be elected by a plurality of votes, and by ballot, with the exception of the General Committee for the counties which may be appointed by the Executive Committee, who shall have power to fill any vacancies which may occur in the offices of the Society during the year. Extra meetings may be convoked by the Executive Committee. Fifteen members shall be a quorum for the transaction of business. No person shall be qualified to vote at any election of officers of the Society, unless he shall have been a member of the Society for at least thirty days prior to such election.

SEC. 5. The Society shall hold an annual Cattle Show and Fair at such time and place as shall be designated by the Executive Committee.

SEC. 6. The Constitution may be amended by vote of two-thirds of the members attending any annual meeting upon one year's previous notice in writing.

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OFFICERS FOR 1870.

PRESIDENT,
SOLON D. HUNGERFORD, Jefferson.

VICE-PRESIDENTS,
1st district, THOMAS H. FAILE, JR., New York.
2d district, SAMUEL T. TABER, Queens.
3d district, JURIAN WINNE, Albany.
4th district, FRANK D. CURTIS, Saratoga.
5th district, JAMES GEDDES, Onondaga.
6th district, WM. M. ELY, Broome.
7th district, BENJ. F. ANGEL, Livingston.
8th district, RICHARD CHURCH, Allegany.

CORRESPONDING SECRETARY,
THOS. L. HARISON, St. Lawrence.

RECORDING SECRETARY,
ADIN THAYER, JR., Rensselaer.

TREASURER,
LUTHER H. TUCKER, Albany.

EXECUTIVE COMMITTEE,

MILO INGALSBE, Washington.	FORDHAM MORRIS, Westchester.
ROBERT J. SWAN, Seneca.	WM. CHAMBERLAIN, Dutchess.
EDWIN THORNE, Dutchess.	JOS. JULIAND, Chenango.
W. H. WATSON, Orleans.	JAS. W. WADSWORTH, Livingston.

EX-PRESIDENTS,

T. C. PETERS.	MARSENA R. PATRICK.
J. STANTON GOULD.	THOMAS H. FAILE.

SAMUEL CAMPBELL.

ENTOMOLOGIST,
ASA FITCH, M. D.

CHEMIST TO THE SOCIETY,
CHARLES H. PORTER, M. D.

MECHANICAL AND CONSULTING ENGINEER,
HENRY WATERMAN.

CONSULTING VETERINARIAN.
Prof. JAMES LAW, M. R. V. C.

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EX-PRESIDENTS.

Year.	Name.	Location fair.	Year.	Name.	Location fair.
1841..	Joel B. Nott...	Syracuse.	1856..	T. S. Faxton.....	Watertown.
1842..	James S. Wadsworth*	Albany.	1857..	Alonzo S. Upham...	Buffalo.
1843..	James S. Wadsworth	Rochester.	1858..	Wm. T. McCoun...	Syracuse.
1844..	John P. Beekman*..	Po'keepsie.	1859..	Abraham B. Conger.	Albany.
1845..	Benj. P. Johnson*..	Utica.	1860..	B. N. Huntington..	Elmira.
1846..	James M. Sherwood.	Auburn.	1861..	George Geddes.....	Watertown.
1847..	George Vail.....	Saratoga.	1862..	Ezra Cornell.....	Rochester.
1848..	Lewis F. Allen.....	Buffalo.	1863..	Edward G. Faile...	Utica.
1849..	John A. King*.....	Syracuse.	1864..	James O. Sheldon..	Rochester.
1850..	E. P. Prentice.....	Albany.	1865..	Theodore C. Peters.	Utica.
1851..	John Delafield*.....	Rochester.	1866..	J. Stanton Gould...	Saratoga.
1852..	Henry Wager*.....	Utica.	1867..	Marsena R. Patrick.	Buffalo.
1853..	Lewis G. Morris....	Saratoga.	1868..	Thomas Hall Faile.	Rochester.
1854..	William Kelly.....	New York.	1869..	Samuel Campbell...	Utica.
1855..	Samuel Cheever....	Elmira.			

* Deceased.

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LIFE MEMBERS.

[Deceased members are marked with an asterisk.]

A.

Allen, William M., Harlem.
Allen, Lewis F., Black Rock.
Aspinwall, J. L., Barrytown.
Agnew, Alexander M., New York.
Allen, John, New York.*
Ayerigg, T. G., New Jersey.
Andrews, B. H., Waterbury, Conn.
Aspinwall, William H., New York.
Abernethy, Charles, New York.
Ames, D. T., Syracuse.
Arnold, Wm. E., Otego.
Austin, J., Jr., Albany.
Adriance, J. P., Poughkeepsie.
Arnold, B. G., New York.
Agnew, Cornelius R., New York.
Angel, B. F., Geneseo.
Astor, John Jacob, Jr., New York.
Avery, Ralph H., Canastota.
Arnot, S. T., Elmira.

B.

Beekman, John P., Kinderhook.*
Bell, Thomas, Eatontown, N. J.
Buell, William, Rochester.*
Becar, Noel J., New York.*
Brown, Lewis B., Westchester.
Boughton, Chauncey, Waterford.
Bowen, Henry C., Brooklyn.
Burkhalter, Charles, New York.*
Balcom, Uri, Oconto, Wisconsin.
Brown, Wm. Smith, New York.
Boorman, James, Hyde Park.*
Brown, Lewis M., New York.
Bradley, George C., Watertown.
Boyce, William, New York.
Brown, William J., Fairhaven.
Byram, A. G., New York.
Baldwin, Harvey, Syracuse.*
Buck, A. H., Lowville.
Burr, William M., Jr., Cazenovia.
Bulkely, D. A., Williamstown, Mass.
Bailey, Isaac H., New York.
Babcock, Samuel D., New York.
Butler, B. C., Luzerne.
Babcock, F. M., New York.
Bowne, S. R., Rhinebeck.
Bruen, Alexander M., Scarsdale.
Brooks, Daniel E., New York.
Butler, Charles, New York.
Bogart, M. D., Rockland Lake.
Barry, P., Rochester.
Bard, John, Tarrytown.
Bradley, S. W., Olean.
Boardman, Truman, Trumansburgh.
Benham, A. B., Dryden.
Bailey, N. P., New York.
Bonesteel, Peter S., Victor.
Brown, George D., Lowville.
Brown, George H., Millbrook.
Baker, B. M., Rochester.
Beebe, William, New York.
Butterfield, J., Utica.*
Bliss, Jonathan.
Brown, John Crosby, New York.
Brown, James, New York.
Barber, A. D., New York.
Baldwin, A., Yonkers.
Brizee, Teunis, Pittsford.
Baker, A. Y., Hammondsport.
Birdsall, Benjamin, Mendon Centre.
Barto, H. D., Trumansburgh.
Bowne, Robert, New York.
Beadle, E. L., Poughkeepsie.
Boyce, Ker, Flushing.
Brown, Alex'r, North Bridgewater.
Bryden, Robert E., New Hartford.
Barnard, Charles, Utica.
Brown, J. P., Utica.
Bowen, H., Medina.
Butterfield, Charles E., Utica.
Blanchard, J. H., Utica.
Burch, H. M., ——.
Baker, B. F., Ballston.
Brown, D. D. S., Rochester.
Blake, W. C., Northfield, Vt.
Beckwith, B. M., Plattsburgh.
Bennett, Wm. H., Saratoga Springs.
Bostock, E., Albany.
Banks, John, Bainbridge.
Bartlett, H. B., Paris.
Baker, I. V., Comstock's Landing.
Butterfield, Daniel, New York.
Boswell, John, Chili.
Bell, John H., West Brighton.
Babbitt, B. T., New York.
Bicknell, J. Y., Westmoreland.
Brown, J. Emery, Churchville.
Brown, J. Tilden, New York.
Bronc, Tobias, Cobleskill.
Bowne, Walter, Flushing.
Bristol, Wheeler H., Owego.
Buckley, Wade, Port Jervis.
Bogart, Wm. H., Aurora.

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C.

Campbell, William Bayard, New York.
Corning, Erastus, Albany.
Corning, Erastus, Jr., Albany.
Clark, George, Springfield.
Coleman, Robert B., New York.*
Crocker, David Jr., New York.*
Clafflin, Horace B., Brooklyn.
Case, Thomas R., Simsbury, Ct.
Corey, John A., Saratoga Springs.
Curtis, E. L. B., Danby.
Cromwell, William, New York.
Cook, E. G., Belleville.
Campbell, John, New York.
Conger, A. B., Waldberg.
Clarke, Alfred, Springfield*.
Crane, John J., Morrisania.
Clarkson, Augustus, Potsdam.*
Chesebro, E., Guilderland.*
Catlin, D. W., New York.*
Chambers, James, Scarsdale.
Clement, Isaac, Mechanicsville.*
Cocks, Isaac H., North Hempstead.
Cornell, Ezra, Ithaca.
Crittenden, Norman, Ithaca.
Cornell, Alonzo B., Ithaca.
Cornell, Franklin C., Ithaca.
Cornell, O. H. Perry, Ithaca.
Chrystie, Albert N., Havre, France.
Chauncey, Henry, Jr., New York.
Chatfield, T. I., Owego.
Campbell, Samuel, New York Mills.
Carroll, Charles H., Geneseo.*
Cornell, Charles Ezra, Ithaca.
Cobb, Emory, Chicago.
Camp, Hugh, N., New York.
Chipman, H. W., White Plains.
Childs, S. D., Utica.*
Churchill, A., Utica.*
Cogswell, W. L., New York.*
Champlin, C. B., Hammondsport.
Crosman, C. F., Rochester.*
Chatfield, A. F., Albany.
Copeman, A. S., Utica.
Cooke, Rolland C., Whitehall.
Collender, Hugh W., New York.
Coffin, Edmund, New York.
Cole, Walter, Batavia.
Coan, Luke, Westmoreland.
Clark, Leander, Newburgh.
Crofoot, James R., Constableville.
Clarke, Almonde, Whitestown.
Cary, H. N., Whitesboro.
Coulter, J. E., New York.
Cowdin, Elliott C., New York.
Curtis, Frank D., Charlton.
Carpenter, Franklin, South Corinth.
Chamberlain, D. D., New York.
Church, Richard, Belvidere.
Cady, Charles, Dryden.
Crego, Russell, Albany.
Church, Elihu, Riga.
Cooper, Joseph M., New York.
Crosman, C. W., Rochester.
Campbell, James K., New York.
Cunard, Sir Edward, New York.*
Cunningham, James B., White Plains.
Callanan, Henry, Coeymans.
Cannon, Legrand B., New York,
Crosman, C. W. S., Rochester.
Crosier, William, Northport.
Cossitt, Davis, Onondaga.
Champlain, Marshall B., Cuba.
Conklin, John P., Saratoga Springs.

D.

Delavan, H. W., Ballston.*
Delafield, John, Oakland.*
Dickey, George, New York.*
Dinsmore, William B., Staatsburgh.
Demarest, Abram A., New York.
Defreest, John K., Defreestville.
Draper, Simeon, New York.*
De Witt, Edward, New York.
Dater, Philip, New York.*
Dillon, Robert B., New York.
De Forest, D. W. C., Defreestville.
Dill, John B., Auburn.
Dows, David, New York.
Devereux, John C., Ellicottville.
Dollner, Harold, New York.
Doolittle, Charles H., Utica.
Dagwell, John, Utica.
Dorland, William L., Dean's Corners.
Dickey, Charles D., New York.
De Angeles, W. W., Holland Patent.
Dodge, Henry, Washington Mills.
Downer, Charles, Utica.
Dewey, C. D., Port Leyden.
Dodge, W. E., New York.
Dater, James, New York.
Doelker, George, Albany.
Dike, Henry A., New York.
Dwight, J. W., Dryden.
Davenport, Charles L., Syracuse.
Dagge, Edward, Rochester.
Dike, James P., New York.
Denniston, William, New York.
Dodge, J. P. B., Esopus.
De Freest, Martin D., De Freestville.
Davis, J. C. Bancroft, Newburgh.
Didama, John E., Medina.

E.

Edmonds, F. W., Bronxville.*
Emmett, Thomas Addis, Astoria.*
Earle, Morris, New York,*
Ellwanger, George, Rochester.
Edwards, Edward, South Corinth.
Erwin, Charles H., Painted Post.
Eddy, John W., ———.
Erwin, E. H., Painted Post.
Elliott, John, New York.
Everett, William E., Rye.
Ellis, Edwin, Albany.
Ely, William M., Binghamton.

F.

Fairbanks, T., St. Johnsbury, Vt.*
Fairbanks, E., St. Johnsbury, Vt.
Fairbanks, H., St. Johnsbury, Vt.

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Fellows, Joseph, Bath.
Foster, H. Ten Eyck, Lakeland.*
Finlay, J. Beekman, Saratoga Springs*.
Faile, Edward G., New York.*
Faile, Thomas H., New York.
Faile, Edward, West Farms.*
Faile, Charles V., New York.
Faile, Samuel, White Plains.
Fox, William W., New York.*
Furman, John M., New York.
Faxton, T. S., Utica.
Fox, George S., West Farms*.
Forbes, Paul S., Beaverwyck.
Frost, J. T., Clinton Point.
Ferris, Wm. L., Westchester.
Faile, Henry, New York.
Frame, William, Flushing.*
Faile, Thomas H., Jr., New York.
Fields, P. H., Geneva.
Fitch, Asa, East Greenwich.
Fuller, Dudley B., New York.*
Furguson, Amos, Utica.
Farwell, Samuel, Utica.
Foster, James S., New Hartford.
French, L. L., Page's Corners.
Freer, S. D., Cortlandville.
Freeman, Isaac, Bemis Heights.
Filley, Samuel R., Woodstock.
Ford, Henry A., Westerlo.
Foster, Frederick G., New York.
Foster, Edmund B., West Stockbridge.
Ferris, John, Moresville.
Frothingham, Wm., Washington Heights.
Fitch, Mason P., Elmira.
Fellows, Benjamin, Clifton.

G.

Geddes, George, Fairmount.
Gauley, William M., New York.*
Goldsmith, R. F., West Southold, L. I.
Glenn, W. W., Baltimore, Md.*
Granger, Oscar, Saratoga Springs.*
Gallup, S. M., New York.
Greig, John, Canandaigua.*
Griffin, Elihu, Clinton Corners.*
Green, John C., New York.
Granger, Gideon, Canandaigua.*
Gould, John Stanton, Hudson.
Gilman, Arthur, Lee, Mass.
Geddes, James, Fairmount.
Green, A. H., New York.
Gunn, S. W., Kirkland.
Gilbert, E. M., Utica.
George, Thomas, Newburgh.
Gandy, Shephard, New York.
Galbraith, Thomas, Washington Hollow.
Gibbs, I. E., Watertown.
Greenman, Silas C., Utica.
Gregory, H. C., Unadilla.
Gibbs, R. B., Harpersfield.
Granger, Foster O., Saratoga Springs.
Grumman, Wm., Newark, N. J.
Gordon, Robert, New York.
Griswold, John A., Troy.
Gould, Thomas, Aurora.
Goodman, R., Lenox, Mass.
Grice, C. C., New York.
Greenway, John, Syracuse.
Gould, David G., Quaker Hill.
Graham, James H., Delhi.

H.

Huntington, Benjamin N., Rome.
Hartshorne, George, Rahway, N. J.
Haviland, I. E., Hempstead Branch.
Haight, Edward, Westchester.
Hunt, Wilson G., New York.
Hopkins, Lucius, New York.
Herrick, John H., New York.
Harold, John, Hempstead.
Holmes, A. B., New York.
Hastings, George F., Shushan.
Hoadley, Luther, Harwinton, Conn.
Hayward, E. S., Rochester.
Hurst, William, Albany.
Hall, Peleg, New York.
Hoe, Richard M., New York.
Hurlbut, H. A., New York.
Hamilton, D., Watervliet.*
Herrick, E. H., New York.*
Haven, John, New York.
Herrick, Jacob B., New York.*
Howell, Benjamin H., New York.
Hoe, Peter S., New York.
Hilton, Joseph, New Scotland.
Hopkins, Henry, New York.*
Houpt, Henry H., Dryden.
Hungerford, Solon D., Adams.
Huestis, Hugh, Adams.
Hovey, C. M., Boston.
Hayes, Clark I., Unadilla.
Harison, Thomas L., Morley.
Harison, Richard M., New York.
Harison, George D. L., New York.
Harison, Francis, New York.
Howland, Obadiah, Auburn.
Harberger, J. S., New York.
Hopkins, O., New York.
Heyne, Carl, Red Hook.
Huntington, E., Rome.
Hart, H. R., Utica.
Hawley, J. S., Binghamton.
Hallett, J. S., New York.
Hager, John G., Rhinebeck.
Houghton, W. J., ——
Harder, M., Cobleskill.
Hoyt, D. C., ——
Hendrick, James, Albany.
Harris, Joseph, Rochester.
Herring, Silas C., New York.
Hoyt, Alfred M., New York.
Hicks, B. D., North Hempstead.
Hatch, Lewis M., Ashville, N. C.
Hoge, William, Tarrytown.
Holmes, Wm. M., Greenwich.
Hess, Elmon, West Somerset.
Hubbell, Alrick, Utica.
Hunt, Ward, Utica.
Hopkins, W. R., Utica.
Howland, Joseph, Matteawan.
Heffron, D. S., Utica.
Holden, E. C., McGrawville.

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Hodge, John, Lockport.
Hubbell, Eli S., Elmira.
Holmes, H. C., Quaker Springs.
Hamilton, William, Westmoreland.
Hay, A. B., Troy.

I.

Isham, W. B., New York.*
Irvin, Richard, New York.
Ives, Julius, Jr., New York.
Ives, Julius, New York.
Ingalsbe, H. H., South Hartford.
Ingalsbe, Milo, South Hartford.
Ingalsbe, James L., South Hartford.
Irwin, D. B., Middletown.

J.

Johnson, B. P., Albany.*
Jones, Edward, Rhinebeck.
Jackson, John C., New York.
Johnson, Samuel Wm., Ellicottville.
Johnston, James Boorman, New York.
Johnston, William S., Poughkeepsie.
Jay, John, Katonah.
Jones, O. W., New York.
Johnson, William, Geneva.*
Johnson, Bradish, New York.
Johnson, R. L., Albany.
Jervis, John B., Rome.
Jones, David R. Floyd, S. Oyster Bay.*
Johnston, John T., New York.
Jones, Morris R., Rome.
Juliand, Joseph, Bainbridge.
Judd, Orange, New York.
Jewell, A. L., Waltham, Mass.
Jaffray, Edward S., New York.
Johnson, Benj. W., Albany.

K.

Kelly, William, Rhinebeck.
King, John A., Jamaica.*
Keene, Stephen S., New York.
Kirtland, B. B., Greenbush.*
Kennedy, Robert L., New York.
Ketchum, Morris, New York.
Keese, Samuel T., New York.
Kidder, K. P., Burlington, Vt.
Kelly, Henry, New York.*
King, John A., Jr., Great Neck.
Kelly, William, Jr., New York.
Kellogg, P. V., Utica.
King, P. V., New York.
Kirk, George Wistar, New York.
Kingsland, Thos. B., New York.
Keays, Edward, Albany.

L.

Leray, De Chaumont, Leraysville.*
Lenox, James, New York.
Livermore, Charles F., New York.
Lee, John R., Buffalo.
Ludlow, William H., Sayville.
Lincklaen, Ledyard, Cazenovia.*
Lawrence, Edward A., Flushing.
Leggett, Edward W., Harlem.*
Lockwood, E., New York.*
Landon, William, Albany.*
Lee, William H., New York.
Leavitt, Henry S., New York.
Lockwood, George, New York.*
Leland, Simeon, New York.
Lawrence, F. N., Flushing.
Leonard, Moses G., Rockland Lake.
Lexow, Rudolph, Nanuet.
Livingston, E. P., Clermont.*
Lawrence, L. H., Utica.
Lawyer, Luther, Perth River.
Lowber, R. W., New York.
Lay, F. W., Greece.
Leverich, C. P., New York.
Lambert, W. G., Jr., Chappaqua.
Lord, J. Cooper, New York.*
Lee, David B., New York.
Lorrillard, L. L., West Farms.
Look, S. J., Clayville.
Lyman, David, Middlefield, Conn.
Lord, H. G., ——.
Leland, W. W., Saratoga Springs.
Leland, C. E., Saratoga Springs.
Loomis, H. B., New York.
Lawrence, De Witt C., New York.
Lewis, Harris, Frankfort.
Leverich, Charles D., Newtown.
Lee, William, Schenectady.
Lane, George W., New York.
Livingston, Robert J., New York
Littlefield, R. M., Afton.

M.

McIntyre, J. McDonald, Linlithgo.
Marvin, James M., Saratoga Springs.
Morris, Lewis G., Mt. Fordham.
McIntyre, Archibald, Albany.*
Maitland, William C. Fordham.
McGraw, Joseph, Dryden.
Murray, George, New York.
Morris, Fordham, Mt. Fordham.
Morris, Francis, Mt. Fordham.
Munn, Samuel, Mott Haven.
Miller, James M., New York.
Miller, Daniel S., New York.
McGraw, John, Ithaca.
Mortimer, John H., New York.
Marks, Enoch, Camillus.
Mather, F. E., New York.
Mordoff, M. C., Rochester.
Messenger, Thomas, Great Neck, L. I.
Masterton, Robert M., Bronxville.
Maxwell, Hugh, New York.
McCredy, Dennis A., New York.*
Moore, D. D. T., New York.
Mauran, S. E., White Lake.
Mitchell, O. M., Saratoga Springs.*
Masterton, Alexander, Bronxville.
Munroe, Allen, Syracuse.
Maxon, Thomas V., Adams.
McCall, James S., Geneva.
Morss, B. G., Red Falls.
Morrison, James M., New York.
Matteson, James M. Jacksonville.
Morgan, J. E., Deerfield.
Middleton, R., Utica.

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Mason, D. C., New Hartford.
Mecke, J. A., New York.
Maitland, R. L., New York.*
Mason, J. W., Brooklyn.
Moller, W. T.. Irvington.
Mesick, P., Albany.
Mathewson, Park, Williamsport, Pa.
Messenger, W. S., Great Neck, L. I.
Minturn, Robert B., New York.
Matteson, O. B., Utica.
Millard, S. A., Clayville.
Mason, S. M., New Hartford.
Mann, J. F., Utica.
Melick, William B., Albany.
Matthewson, J. E., New Berlin Centre.
Munson, E., Tyre.
Merriam, Charles M., Leyden.
Mowry, J. F., Deansville.
Moffat, John N., New York.
Miller, Seth, Constableville.
Merriam, C. L., Leyden.
Morrell, Robert, Manhassett.
Mitchell, Samuel L., New York.
Moon, C. B., Saratoga Springs.
Myers, John K., Yonkers.
Myers, Marvin E., Charlton.
Musselman, Chauncey, Phelps.
Mills, M. H. Rochester.
McNeil, R. C., Campville.
Mount, Andrew, New York.

N.

Norton, Robert, New York.
Nourse, J., Boston, Mass.
Nellis, A. J., Bath.
Nusbaum, Israel, Albany.

O.

Odell, William T., Ballston Spa.
Otis, H. G., Geneva.
Osgood, Jason C., Troy.
Olmstead, H. M., Morristown.
Osborn, Amos O., Waterville.
Ostrander, W. P., Schuylerville.
Owen, Jesse, Chemung.

P.

Patrick, M. R., Manlius.
Prentice, Ezra P., Albany.
Plumb, Josiah B., Albany.
Phelps, Thomas W., New York.
Peet, Harvey P., New York.*
Pease, R. H., New York.
Post, William, New York.*
Paton, Thomas, New York.
Phelps, Peter, Derby, Ct.
Phelps, Royal, New York.
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Pinkney, Thomas, Bronxville.
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Penfold, E., New York.*
Park, H. S., New York.
Pine, G. W., Herkimer.
Priest, Z. C., Utica.
Priest, D. E., Utica.
Palmer, J. L., Adams Centre.
Pine, Ai, Pittstown.
Pomroy, William H., New York.
Peugnet, Charles, Cape Vincent.
Palmer, N., Hudson.
Palmer, T. G., Hudson.
Page, J. R., Sennett.
Penfold, E., New York.
Prentiss, J. H., Utica.
Palmer, A. W., Amenia.
Potter, Howard, New York.
Pearsall, N. B., Morris.
Purdy, Samuel M., West Farms.
Paton, William, New York.
Peet, Isaac Lewis, New York.
Pinckney, Stephen R., New York.

R.

Rust, Philo N., Syracuse.*
Rotch, Francis, Morris.
Robinson, Henry, Newburgh.
Richardson, Thomas, Westchester.*
Reed, Almet, New York.
Rogers, Henry W., Buffalo.
Rathbun, L. W., Springfield.
Rotch, Francis M., Morris.*
Randall, Nathan, Syracuse.
Robbins, George A., New York.
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Randall, Benjamin, Adams.
Read, William G., New York.
Robinson, Charles, Fishkill Plains.
Reynolds, M. F., Rochester.
Rockwell, S. D., New York.
Read, J. H., Utica.
Randall, H. S., Cortland.
Rankin, W., Charlotte.
Richards, D. C., Fort Washington.
Rogers, D. E., Wheatland.
Rowe, J., Poughkeepsie.
Riggs, C. G., Turin.
Ramsdell, L., Greeneville.
Randall, N. W., Bristol Centre.
Reeve, J. H., Wells Corners.
Ripley, Joseph, New York.
Rider, Zerah, Cambridge.
Root, Samuel, Westport.
Ronan, Patrick, Elmira.
Remington, M. C., Weedsport.

S.

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Seward, William H., Auburn.
Seymour, Horatio, Utica.

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Sheafe, J. F., Dutchess.
Smith, N. Everett, New York.
Sherman, Benj. B., New York.
Smith, D. D., New York.
Sherman, C. A., New York.
Sherman, B. L., New York.
Spaulding, Henry F., New York.
Swan, Robert J., Rose Hill.
Southworth, John Ellis, New York.
Stuart, Robert L., New York.
Stuart, Alexander, New York.
Sloane, Samuel, New York.
Sheldon, James O., Geneva.
Suydam, Henry, Jr., New York.*
Sands, A. B., New York.*
Smith, Silas G., Mechanicsville.
Smith, M. M., Lowville.
Swan, Benjamin L., Oyster Bay.
Slingerland, William H., Norman's kill.
Schenck, William J., New York.
Smull, Thomas, New York.*
Southworth, John, Dryden.
Seney, George J., New York.
Spofford, Paul, New York.*
Shark, Anthony, De Freestville.
Sheldon, Lucius M., Geneva.
Swain, James P., Bronxville.
Simpson, William, West Farms.
Strong, Benjamin W., Newtown.
Simpson, John V., West Farms.
Sherill, Eliakim, Geneva.*
Standring, L. S., Deer River.
Saunders, Thomas P., Adams.
Simpson, William, Jr., West Farms.
Sherwood, Frederick, New York.
Smith, Albert, New Rochelle.
Sisson, G. M., Genoa.
Sherrill, Lewis, Greenville.
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Sampson, G. G., Brooklyn.*
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Shonnard, E. F., Yonkers.
Sherman, S., Lundy's Lane, Pa.
Simpson, ——, White Plains.*
Seaman, P., Newburgh.
Sherman, Ira E., Sidney Plains.
Swan, William H., New York.
Stephenson, G. S., New York.
Southworth, ——, Utica.*
Savage, Thomas, New Hartford.
Spriggs, J. T., Utica.
Spencer, J. E., Utica.
Sweezy, George W., New York.
Schuyler, Peter C., New York.
Seeley, D. W., Albany.
Sheldon, James, Geneva.
Swain, Thomas M., Bronxville.
Stillman, Charles, Woodstock.
Sturges, Jonathan, New York.
Schoonmaker, Henry, Cedar Hill.
Sherman, W. C. H., Newburgh.
Sharp, Jacob, Rome.
Safford, Halsey, East Otto.
Staley, Daniel G., Albany.
Sandford, Charles, New York.
Schreiner, O. H., New York.
Scott, John H., New York.
Stockwell, S. S., New York.
Stevens, S. W., Rochester.
Selkreg, J. H., Ithaca.
Schultz, Walter J., New York.
Simpson, J. B., Jr., New York.
Smith, Solomon P., Waterford.

T.

Thompson, Samuel L., Setauket.
Tucker, Luther, Albany.
Thorne, Jonathan, New York.
Thorne, Edwin, New York.
Thorne, Samuel, Thorndale.
Titus, James H., Malone.
Taber, Samuel T., Roslyn, L. I.
Tomes, Francis, Jr., New York.
Thayer, Adin, Jr., Hoosick Falls.
Thompson, James, Ballston Spa.
Tappan, John L., New York.
Toole, William S., New York.
Terry, Edmund, Utica.
Thorne, Stephen, Utica.*
Tripp, Lemon B., North Castle.
Thomas, Herman, Saratoga Springs.
Thomas, John, Frankfort.
Ten Broeck, W. S., Rhinebeck.
Tweed, Wm. M., New York.
Tucker, Luther, H., Albany.
Toby, Silas W., Hudson.
Toby, Arthur, Pittsford.
Taylor, John W., ——
Townsend, John, Albany.*
Thompson, Frederick, New York.
Tweddle, George, Albany.
Taylor, E. M., Elmira.
Titus, Charles M., Ithaca.

U.

Upham, A. S., Le Roy.
Underhill, Daniel, Jericho.
Underhill, Richard T., Croton Point Vine yard.

V.

Vail, George, Troy.
Van Rensselaer, Gen. Stephen, Albany.*
Van Rensselaer, Stephen, Jr., Albany.*
Van Rensselaer, William P., Albany.
Van Pelt, Henry, New York.*
Van Rensselaer, R. H., Morris.
Van Antwerp, John, West Farms.
Van Alstyne, P. Edward, Kinderhook.
Van Wie, Peter, Cedar Hill.
Van Horn, G. H. F., Fonda.

W.

Wadsworth, James, Geneseo.*
Wadsworth, James S., Geneseo.*
Wadsworth, William W., Geneseo.*

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White, Hollis, Niagara Falls.
Ward, John, New York.*
Wells, Henry, Aurora.
Watson, William, West Farms.
Wainwright, C. S., Rhinebeck.
Wolfe, John David, New York.
Wykoff, S. S., New York.
Whitlock, Benjamin M., West Farms.
Willetts, Robert, Bayside, L. I.
Wetmore, Prosper M., New York.
Wilkin, J. W., Goshen.
Weed, William H., New York.
Wilson, Catlin, Eutaw, Alabama.
Weston, Frederick, Sandy Hill.
Wendell, Herman, Albany.
Weed, W. W., Buffalo.*
White, William M., Canaseraga.
Woodworth, Augustus P., New York.
Whitney, Orla H., Mexico.*
Walbridge, D. T., Rochester.
White, Hugh, Waterford.*
Willard, G. L., Cold Spring.
Wight, R. A., Albany.
Williams, J. B., Ithaca.
White, Rufus P., Adams.
Wood, Amos F., Woodville.
Ward, F. B., Le Roy.
Wolfe, N. H., New York.
Warner, Horatio G., Rochester.
Wende, Herman, Alden.
Wende, B. A., Alden.
Wood, Orren S., Montreal.
Winne, Jurian, Bethlehem.
Williams, J. E., New York.
Wackerhagen, E., Albany.
Wetmore, Benjamin C., New York.
Wadsworth, Craig W., Geneseo.
Williams, S. L., Perrinton.
Whitney, George J., Rochester.
Wilcox, A. T., Fayetteville.
Wheeler, G. H., Hammondsport.
Wilbur, R. P., Lowville.
Woodford, F. T., Utica.
Walrath, Solomon, Rensselaer Falls.
Willetts, Samuel, New York.
Walcott, W. D., New York Mills.
Wilson, Charles S., Utica.
Wood, E. D., Utica.
Wolcott, S. G., Utica.
Willard, X. A., Little Falls.
Watson, H. M., Buffalo.
Wier, Henry, Johnsonville.
Wing, John D., Dutchess.
Wade, Elias, Jr., New York.
Watts, John, Ithaca.
Wood, W. Anson, Hoosick Falls.
Wells, Eugene, Rhinebeck.
Warner, Daniel D., Canaan.
Wendell, Charles, Albany.
Wier, H. C., Sugar Loaf.
Wadsworth, James W., Geneseo.
Wendell, E. A., Albany.
Wood, John E. Middleton.
Watson, W. H., Medina.
Warner, George H., New York Mills
Welles, John C., Athens, Pa.
Willers, Diederich, Jr., Varick.
Wilson, James H., Whitesboro.

Y.

Yelverton, Robert, New York.

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STATE OF NEW YORK.

No. 211.

IN ASSEMBLY,

April 5, 1870.

TRANSACTIONS

OF THE

NEW YORK STATE AGRICULTURAL SOCIETY.

AGRICULTURAL ROOMS,
ALBANY, *April* 4, 1870.

To the Hon. WILLIAM HITCHMAN,

Speaker of the Assembly:

SIR.—I herewith transmit to the Legislature the Twenty-ninth Annual Report of the New York State Agricultural Society, and the abstracts and documents accompanying the same.

Very respectfully,

Your obedient servant,

T. L. HARISON,

Corresponding Secretary.

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TRANSACTIONS

OF THE

New York State Agricultural Society.

REPORT OF THE EXECUTIVE COMMITTEE.

To the Honorable the Legislature.

The Executive Committee of the New York State Agricultural Society, in presenting their annual report to the Society and to the Legislature, call gratefully to mind the bounty of the beneficent Creator and Ruler of man and nature in the plenteous yields of the fruits of the earth during the year now ended. Occupying as do the farmers of New York a country so physically formed and situated as to be far more uniform in its productions than most others, and almost exempt from extremes of drought, moisture and temperature, we have in our annual record of the crops and seasons to mention variations in yields and character that are slight compared with those that occur in less favored climes. It would, perhaps, be difficult to point out any season within living memory in which the cultivators of our soil have not, as a body, been rewarded with satisfactory returns of their labors. Local inequalities doubtless occur often; but the farming of the State, taken as a whole, is always successful in its production, though from external causes it may not always be equally remunerative in its results. We have good reason to be grateful. We possess a territory of great advantages as regards climate. Our soil, though it varies in its character and capacities, is throughout the State, excepting in a few small sandy districts whose resources are generally greatly underrated, justly characterized as strong and fertile in the production of the crops suited to the district, whatever they may be. We have soils capable of the highest pro-

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duction of the most esteemed of the cereals; others in which the most nutritious grasses find their natural habitation; there are districts in which almost tropical plants flourish, and in but few parts of our territory is there not capability for all the products of the temperate zone. Varied, comprehensive, safe is the agriculture of New York, and herein lies the secret of our uniform prosperity. Confined to no specialty, tied down to no limited range of enterprise, possessing advantages of ready access to markets, tilling a soil strong in its resources of fertility and yet requiring in different degrees the application of intelligent labor to develope these resources and to bring it to the highest agricultural condition, the farmers of our State are placed in a natural school of agriculture, in which the highest prizes are offered to such as bring vigor, intelligence and liberality to the practice of their profession. In our State, therefore, should be found the field for improvement. In our practice, as total failure is almost impossible, experiments are comparatively safe, and scientific progress should be rapid because theory may be reduced to fact without the risk of ruin.

The peculiarities of the season of 1869 may be stated as consisting in the coolness and superabundant moisture of early summer and harvest, and the late occurrence of the frosts of autumn, although the summer as a whole was characterized by a low degree of heat. The consequences have been a large yield generally of the cereals and an abundant hay crop, with a good deal of trouble in securing both, and a tardy growth of Indian corn in the former part of the season, which was made up by the heat of early autumn and the protraction of the period of growth at the end of the season. Grain crops of all kinds have been good, especially the oat crop, which was unusually large. Corn has turned out beyond expectation in quantity and quality. Potatoes have yielded largely, but have been subject to more disease than usual. Hops have made a fairly good return in general, northern New York perhaps excepted, and have been more remunerative than last year. Dairymen have had a very good year. Their produce has been large, and it has brought a good price, cheese having been specially profitable; and the rearing and feeding of cattle and sheep for meat have been highly successful and remunerative.

The chief disappointment of the year is the comparatively low price of grain of those kinds, such as wheat and barley, which we sell, and the prices of which are dependent upon the rates current in the grain markets of Europe. Whatever may be the cause of the present depression (and many of the best commercial authorities seem to be

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unable to account for it) it has gone so far as to reduce the prices below the limit of profitable production, and the effect has been to cut off the returns of our best grain farms to such an extent as, in many cases, to make the business of the year a losing one, even where the crops have been good. The experience of the season will undoubtedly lead many to a change of system. Farms managed chiefly with a view to the production of cereals will be turned to the production of meat; and, fortunately for their owners and for the State, the lands best adapted to wheat and barley are in the highest degree productive of clovers and the grasses. The change will be a good one. There are no lands in the country that will produce more beef and mutton per acre than the wheat lands of western New York, and a restorative system will be substituted for an exhaustive one.

The dairy farmers, whose profits during the year have been much better than those of the grain growers, have prosecuted their branch of productive agriculture with increased vigor. Under the factory system the cheese dairies return very satisfactory profits, with the least possible care and toil to the owners and their households. Their success is probably to be, in years to come, still greater. The problem of increasing the yield of milk, every ounce of increase over the increased cost of feeding being clear profit, is now occupying their attention. It is suggested that the means will be found in increased liberality in feeding during the time the cows are dry, and that the dairies that come into profit in the spring in the highest condition will give the best results. It is very gratifying, too, to know that more attention is now being paid to the rearing of dairy stock at home, stimulated by the advance in the price of cows making home-rearing economical, and that the use of thorough-bred bulls on dairy farms is every year extending.

The breeding interest in the State has, during the past year, continued to develope, and New York not only maintains but advances her eminence in this most useful and most interesting of agricultural pursuits. It is yet too soon to predict the success of those enterprising men who have entered upon a systematic course of breeding of horses, but there has been no relaxation of effort in this direction. So far, these efforts have been directed to the production of horses for the carriage and road, such as are also available for general purposes; and the results are believed, from the better character and breeding of the sires employed, to be very hopeful. The introduction of heavy horses for agricultural and draft purposes is desirable. It would seem that breeding such animals should be profitable, especially

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if the Percheron and Suffolk breeds, which, the former especially, combine weight and strength with activity, should be resorted to; but it would be necessary to import mares as well as stallions, the present stock of the country being much better suited to improvement by the use of the thoroughbred horse, than for crossing with the larger breeds mentioned. The large prices, however, obtained for heavy draft horses, would seem to justify the investment of some capital in this way.

The depressed condition of the market for other than combing wools is turning attention to those breeds of sheep that produce that staple, and which are at the same time valuable as meat producers. The Cotswolds are at present the favorites, and the recently introduced Lincolns and the Leicesters are also receiving attention. Valuable importations of both Cotswolds and Lincolns have recently been made, and both breeds seem to thrive in our country. The South Downs seem to be comparatively neglected though no breed of sheep as yet naturalized in the northern States produces meat of such quality as theirs.

In cattle, that breed of universal adaptation and unrivalled usefulness, the short horn, continues to gain in estimation. Some remarkably fine animals of the Booth blood have been imported during the year, and some of the pure Bates blood have been exported to England at prices higher than ever obtained before, while the home demand for well bred animals has been very large at advanced prices. Jerseys continue to be imported and the breed continues to grow in favor.

While the past season in its coolness and moisture, during the times of tillage and harvest, furnished the most conclusive evidence of the value of improved machinery in the operations of the farm, it is gratifying to find that the manufacturers have made great progress toward the perfection of harvesting implements. In 1866, at the Society's trial there was no machine that could be pronounced a perfectly satisfactory self-raking reaper. In 1869, the number of successful self-rakers is almost as large as the number of manufacturers, and at the fair the implements generally showed that inventive genius had been successfully applied to those of almost every class. Few matters are of more importance to our farmers than the successful economical employment of labor-saving machinery. Our harvest season is short, our climate is such that harvest operations, and, in fact, all farming operations admit of no delay, our labor supply is limited and wages are so high as to diminish both the breadth and the thoroughness of our tillage.

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A tolerably full review of the Elmira fair having been printed in the Society's Journal and being appended to this report, it is not deemed necessary to give more space now to that subject than to express the appreciation by the Executive Committee of their cordial reception by the people of that city, and of the thoroughness with which the contractors for the buildings carried out their undertaking.

The reports of the county societies, so far as received, indicate, generally, success and prosperity. Few of these societies, however, at present do more than hold their annual fairs. The town and union societies also give satisfactory reports, and some of them display great energy and spirit in the conduct of their operations. The reports of the Farmers' clubs are, however, the most interesting and satisfactory as a whole, that are made to the State Society. Their operations extend throughout the year, many of them holding weekly meetings for discussions and the interchange of information; some of them are forming libraries, and their management in general seems to be energetic, practical and intelligent. Judging by what is known of those that report to the Society, and there are others believed to be equally successful that do not report, these associations are worthy of high commendation, and should receive all possible encouragement as among the most useful institutions of the time.

The Society has, during the season, prosecuted supplementary investigations on the subject of abortion in dairy herds, under the direction of Dr. Carmalt, the commissioner in charge, whose services have been gratuitously rendered in aid of the cause of agriculture upon his own proposal, which was accepted by the Society because the fund appropriated to the object was nearly exhausted. The area of inquiry has been the dairy region of the State of Ohio, where this difficulty of abortion has not yet appeared, the object being to compare the management of an exempt dairy district with that of the infected districts heretofore fully examined. Dr. Carmalt's report will be presented at the present meeting. The tenor of the information elicited is to confirm the deductions of the report of last season, that the cause is likely to be found in the prolongation of the period of giving milk, the persistent milking during the latter part of the term of pregnancy both weakening and irritating the organs of reproduction, an evil accumulating in injurious tendency by its being continued from generation to generation, whereby the constitutional weakness is probably confirmed and made hereditary.

The esteemed entomologist of the Society has, during the year, pursued his work and has accumulated much valuable matter in his

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department. Ill health has, however, prevented his so digesting and confirming the results of his observations as to admit of presenting them at this time, and they cannot be given to the Society for publication until later in the year.

The correspondence of the Society during the year with the county and town societies and farmers' clubs has increased, but is still not so intimate and frequent as is desirable. The Executive Committee wish it to be understood, not only that they consider it the office of the Society, but also that it is the earnest wish of the officers to render to the other agricultural associations of the State every aid and service that it is in the power of this central organization to afford. There is no desire to interfere with their independence of action or with the line of policy they may adopt; but whenever the State Society can give assistance, it stands ready to do so. Having its office at the capital, it is frequently useful to the county and town societies as a business agent, and it desires also in its monthly journal to afford a vehicle of communication between the several associations if they wish to avail themselves of it. If they would, it is possible they might do good to themselves and to each other. The reports to the State Society, which the law wisely requires as evidence of the continued practical usefulness of the local societies, may also, as is notably the case with some of them, among which the Jefferson, Saratoga and Queens county societies, and the Little Falls Farmers' Club, are deserving of special mention, be made the means not only of communicating valuable information, but of encouraging and animating the working members in each organization by enlarging the range of their usefulness and appreciation, extending the field illumined by the light shining often in a dark place.

The correspondence of the Society and its exchanges with the societies of other States and in foreign countries have continued as heretofore, and the library of the Society has been increased by the gifts from the other State societies and from those abroad, especially those of England, Scotland and France, as also by valuable works presented by the French and Prussian Ministries of Agriculture, contributed by the kind offices of Dr. Flügel of Leipzig, from the Royal Academy of Vienna, from Denmark, Sweden, Bavaria, Switzerland and Italy. The Society is also under obligations to Mr. J. J. Mechi, of England; to Professor Cameron, of Ireland, and to one of its own members, Mr. J. L. Tappan, residing at present in Paris, for valuable contributions and correspondence. Mr. Tappan appears to be ever mindful of the Society during his European travels, and con-

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stantly forwards agricultural publications and copies of newspapers containing matter of agricultural interest.

As will be learned from the report of the Treasurer, the financial position of the Society has not materially changed since last year. The receipts of the exhibition at Elmira were about $5,500 less than those of the Rochester fair in 1868, and, in consequence, since the expenses, except premiums which are slightly increased, are about the same as in the previous year, the Society has not been able to make any addition to its reserve fund. Indeed, but for the interest upon its investment the Society's expenses would have exceeded the receipts. As it is, we carry over within a small amount, the same balance in cash and securities as by last year's statement, the difference not exceeding $300 being, however, on the credit side of the accouut.

The income of the Society depending mainly upon the receipts of the fairs and being, therefore, variable and uncertain, while its expenses are incapable of much reduction, its financial condition is now, as in the past, a matter of anxious concern to its officers and members. In order that our Society shall be useful two things are necessary: first, that it shall have ample pecuniary resources, and second, that it shall have a numerous body of earnest working members and supporters. If the first condition be secured and the management be at all liberal and judicious, it is safe to say that the second will naturally follow, for men will readily join and afterward certainly become active attached friends and supporters of a society from which they are assured of deriving benefit. In agricultural societies as in all other human enterprises the maxim holds good that "nothing succeeds like success," and in all popular organizations like ours pecuniary success, sound financial prosperity, is the beginning of all other success.

The society has up to this time pursued the policy of holding its annual fairs in all parts of the State. It has prescribed certain conditions, namely: That the grounds and buildings, with forage for stock and a small contribution toward wages of laborers, be furnished by the town or city desiring the fair; and it has under this system, so far, always been tendered a welcome reception in one or other of the towns of our State. The greatly increased cost of providing these requirements, and the increased labor and responsibility devolved upon the officers in seeing the conditions fulfilled, resulting from the changes during the past ten years in the cost of labor and materials and from the continual expansion of the exhibitions, have been causes of serious concern. The increase in the expense has seemed to bear

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heavily upon the communities from which the Society has accepted invitations. This has not been because the fairs have not brought profit enough to the towns in which they have been held, the reverse is the case; but because the profit has not always returned to the liberal and public spirited citizens whose names are found upon the list of subscribers to the funds, in proportion to their individual liberality.

There is still another consideration. Owing to the increased accommodation required, and the change in the value of money, the cost of providing for a fair of the State Society has become very considerable, and it seems wasteful and improvident to devote large sums to the erection of buildings to be used but one season. Hence the policy some time since entered upon at Utica and Rochester, of providing grounds and buildings which, though not specially devoted to the purpose or entirely adequate, have yet been so kept up as to supply the required accommodations in a greater or less degree, and therefore to diminish the outlay in each year of the Society's visits.

The disadvantages of the present system have for many years engaged the attention of the thoughtful members of the Society. The plan of having one fixed place for our State fairs was long ago proposed, and to some extent supported, but after full discussion was wisely rejected by the Society. The evils, in fact the ruin, that would result from making the Society a local instead of a State institution, have been heretofore conclusively pointed out, and are, indeed, sufficiently obvious.

Things being so, the only plan that presents any advantages over the present one is that called the rotatory system. Of this we have a successful example in the neighboring province of Ontario, formerly called Upper Canada and Canada West, and the committee think it worth while to call attention to the principal features of the plan there adopted, and now satisfactorily working.

The Agricultural Association of Ontario, or Upper Canada, is, as is well known to many of our members, one of great activity and usefulness, and fully equal, if not superior to ours in the extent of its exhibitions, in the attendance at its fairs, in the number of its members and in the amount of its prizes.

Having previously been managed upon the same system as ours, a change was made by the Upper Canada Society in 1856, when the city of Kingston erected permanent buildings for the fairs at a cost of $11,500 to the city and neighboring country, and $4,000 given by the Society; the conditions being that the fair should be held there

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once in four years. The government of the province furnished the ground, and the $15,500 went to provide the buildings. The population of Kingston at that time was about 12,000, not much more than many of our villages, and the neighboring country was and is both new and poor.

The next Canadian town to enter into the arrangement was Toronto, in 1857, with a population, in 1860, of about 50,000, now about 65,000. Here, as before, and in each of the subsequent cases, the provincial government furnished the land. The erections cost upward of $30,500, of which the Society paid about $5,000, and, subsequently, the city paid over $7,000 more to perfect the buildings.

At Hamilton, the next place that came in, the city expended about $16,000, the Society adding $4,000, total, $20,000 for buildings; and the quartette was completed, in 1863, by adding grounds at London, at about the same outlay and in the same proportions as at Hamilton. The population of Hamilton was, at the time, about 16,000, and of London, about 14,000.

It is stated, upon authority which the committee deem unquestionable, that the cities above named are all thoroughly convinced of the policy of their investments, and satisfied with the results; so much so that each, whenever the fair is held within its limits, contributes voluntarily a large sum, as high in some years as $10,000, to add to the attractiveness of the exhibition, and to insure its success.

It should be mentioned, however, that the interest in their fairs is more general in Upper Canada than in New York, and that the government of the Province is more liberal in its appropriations to agriculture than ours. The annual appropriation to the Association of Ontario for its general objects, aside from specific appropriations, and from the maintenance of an agricultural department, is $4,000, and to the county societies $50,000, of which ten per cent goes to the Provincial Association; and all this is done in a community not nearly equaling in population the State of New York, and possessing not one-third the wealth.

The example, of which the details are here sketched, is believed, by the Executive Committee, to be worthy of serious consideration by the Society, by the Legislature and by the public.

There remains to the committee the mournful duty of recording the ravages made by death in the ranks of the Society during the past year. Our last annual meeting was overshadowed with sadness and sorrow by the news of the loss of Herman Ten Eyck Foster, a member of the Society and of the Executive Board, than whom none

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was more beloved or higher and more deservedly esteemed. But two months later came the final parting with one of the fathers of the Society, the late Benjamin P. Johnson, our permanent executive officer for twenty-two years, the man to whom our Society owes, in so great a degree, its usefulness, dignity and reputation at home and abroad. The Executive Committee has placed upon its records suitable though inadequate testimony of their grief at these lamented deaths, and of their sense, so far as it can yet be realized, of the loss that the Society and the cause of agriculture in the State have been called to sustain, and it has also committed to able hands and sympathizing hearts the painful but pleasing duty of just, unexaggerated eulogy. Painful but pleasing, for while we mourn such men we rejoice that they lived; that they have instructed and influenced us; have worked and sympathized with us, and leaving us and this lower world, have bequeathed to us a precious legacy of example and remembrance.

Of the other members whose places have been made void, two have been commemorated in the journal and records of the Society, Dr. Alexander Thompson, of Aurora, and John Butterfield, of Utica; men both deservedly eminent, both steadfast and earnest friends of the Society, and both, up to the last moment of ability, active in its work, though in different ways. The committee claims the right, on behalf of the Society, to share the grief of the large number of friends and associates who mourn these able, intelligent and useful citizens of our State. May we who survive emulate their examples, and, when our time of departure comes, may we leave a record as honorable as theirs.

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ANNUAL MEETING.

The New York State Agricultural Society met in the Assembly Chamber on Wednesday, the ninth day of February, 1870, at noon, the Hon. Samuel Campbell, President of the Society, presiding.

The report of the Executive Committee was read.

On motion of ex-President Patrick, the same was accepted and adopted as the report of the Society to the Legislature.

The Treasurer presented his report as follows:

RECEIPTS.

Cash and United States securities from last account....	$17,677 96
Life memberships.....	507 00
Annual memberships.....	206 00
State appropriation	1,706 25
State appropriation for Entomologist	1,000 00
T. H. Faile, for special premium.....	200 00
State fair receipts at Elmira.....	16,083 37
Net refreshment rental at Elmira.....	500 00
Net local subscription at Elmira.....	558 44
Interest account	1,295 80
Miscellaneous	70 29
	$39,805 11

PAYMENTS.

Premiums, &c., at annual meeting	$244 05
Premiums of previous years.....	132 00
Salary of Entomologist	1,000 00
Salaries and traveling expenses	5,487 32
Library and museum	276 22
Incidental expenses	391 96
Postage account	484 18
Printing and stationery.....	1,296 55
Abortion in cattle investigation.....	626 75
State fair expenses at Elmira.....	5,675 88
State fair premiums, &c.....	6,212 75
Cash and United States securities now on hand	17,977 45
	$39,805 11

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Which report was accompanied by the usual certificate of the Auditing Committee, and, on motion of ex-President Kelly, the same was accepted.

On motion of ex-President Kelly, the usual committee of three members from each judicial district was ordered for the purpose of nominating officers for the ensuing year, and to recommend, if they see fit, a place for holding the annual fair.

And the following members were, on the nomination of the members present from the several judicial districts, constituted such committee:

First District—Thomas H. Faile, Samuel Thorne, Thomas H. Faile, Jr. Second District—William Kelly, William Chamberlain, Samuel T. Taber. Third District—Tobias Bouck, Horace L. Emery, R. R. Hasbrouck. Fourth District—I. V. Baker, Jr., Chauncey Boughton, B. C. Butler. Fifth District—J. A. Shearman, S. S. Whitman, James Geddes. Sixth District—W. H. Bristol, W. M. Ely, Joseph Juliand, 2d. Seventh District—James O. Sheldon, D. D. S. Brown, William P. Ottley. Eighth District—Lewis F. Allen, John Berry, H. Bowen.

And the committee retired for deliberation, and upon returning, presented, by their chairman, the Hon. William Kelly, a list of officers for the year, and recommended the city of Utica as the place of holding the annual cattle show and fair; which report was, on motion of ex-President Patrick, accepted, and a ballot being had, the following list of officers, nominated by the said committee, was declared duly elected, viz:

President—Solon D. Hungerford, Jefferson.

Vice-Presidents—First District, Thomas H. Faile, Jr., of New York; Second, Samuel T. Taber, of Queens; Third, Jurian Winne, of Albany; Fourth, Frank D. Curtis, of Saratoga; Fifth, James Geddes, of Onondaga; Sixth, William M. Ely, of Broome; Seventh, Benjamin F. Angel, of Livingston; Eighth, Richard Church, of Allegany.

Corresponding Secretary—Thomas L. Harison, St. Lawrence.

Recording Secretary—John Haven, New York.

Treasurer—Luther H. Tucker, Albany.

Executive Committee—Milo Ingalsbe, Washington; Robert J. Swan, Seneca; Edwin Thorne, Dutchess; W. H. Watson, Orleans; Fordham Morris, Westchester; Wm. Chamberlain, Dutchess; Jos. Juliand, 2d, Chenango; James W. Wadsworth, Livingston.

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On motion of Mr. F. D. Curtis, the following resolutions were adopted:

Resolved, That the New York State Agricultural Society approves of the proposed amendment to the tariff, repealing the twenty per cent duty on all "live animals imported for breeding purposes," and that we respectfully recommend its adoption.

Resolved, That a certified copy of the above resolution be forwarded by the Secretary to the presiding officers of both Houses of Congress.

The following resolution was offered by Mr. B. F. Angel, of Livingston.

Resolved, That the interests of the State Agricultural Society would be greatly promoted by the adoption of the rotatory plan for holding our annual fairs, and that Albany and Rochester be recommended as suitable places for beginning this system.

Resolved, That the Executive Committee be requested to devise means to carry this resolution into effect.

On motion of Mr. J. G. Shearman, of Oneida, the resolution was amended by adding Utica to the places recommended.

After discussion, the resolution was, by consent of the mover, laid upon the table, and the Society took a recess until half past seven o'clock.

EVENING MEETING.

The Society re-assembled in the room of the Court of Appeals.

An address was delivered by James Law, Esq., member of the Royal Veterinary College of England, Professor of Veterinary Science in Cornell University, and Consulting Veterinarian to the Society, on the diseases of cattle and the errors of ignorance in their treatment; and

On motion of ex-President Gould, the thanks of the Society were voted to Professor Law, and a copy of his address was requested for publication.

William H. Carmalt, M. D., Commissioner in charge of the Abortion Investigation, presented his report of the supplementary investigations during the year; and,

On motion of ex-President Conger, the thanks of the Society were voted to Dr. Carmalt for the same.

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THURSDAY, FEBRUARY 10TH.

The Society met at the Agricultural Rooms, at 10.30 A. M. Mr. ex-President Gould in the chair, and held a discussion on questions of dairy management.

The Society convened in the Lecture Room at 12.30 P. M., President Hungerford presiding.

Ex-President Patrick delivered the memorial discourse upon the life and services of Benjamin P. Johnson.

Ex-President Conger delivered the memorial of Herman Ten Eyck Foster.

The Society then adjourned.

WINTER EXHIBITION.

REPORTS OF COMMITTEES.—FIELD CROPS.

E. S. Hayward, of Rochester, exhibited a sample of Diehl wheat (quality A No. 1). Area of field, 1.95 acres; expense of seed, cultivation, &c., including rent of ground, twenty-eight dollars, sixty-seven dollars and eighty cents; yield, wheat, eighty-eight bushels, sold at one dollar and eighty cents per bushel, $158.40, straw, thirty dollars; total, $188.40. Net profit, $120.60. The premium list requiring five acres, the judges cannot make an award, but recommend the crop and sample for the favorable consideration of the Executive Committee.

STATEMENT OF CULTIVATION.

The previous crop was beet seed, raised without manure. The crop before that was corn on a timothy sod, manured on the surface, after plowing, with thirty loads of well rotted stable manure per acre.

The farm is located in the town of Brighton, Monroe county, just outside of the limits of the city of Rochester, east. The soil is gravelly loam, not drained, but high land nearly level, except some low spots.

The land on which this crop was raised was plowed about the middle of September, sown broadcast by hand at the rate of one bushel and a half per acre, of the Diehl variety, after which it was harrowed lengthwise of the furrows, and rolled with a heavy iron roller. It made its appearance in four or five days above the ground and grew finely during the fall, and at the commencement of winter the growing wheat nearly covered the ground. The crop wintered well, excepting three or four rods, which was winter killed. Commenced harvesting on the 27th; finished on the 29th July (cut with Dodge & Stevenson reaper). A heavy rain storm came on in the afternoon of the 28th, making it necessary to unbind that previously bound up; on the 29th the rest of the field was cut and bound up and stood for five days, when it was drawn to the barn and immediately thrashed with a machine, cleaned with a mill, and weighed, yielding eighty-eight bushels of clean wheat, sixty pounds per bushel, making forty-five bushels and seven pounds per acre. The following is the

Expense of Crop.

Plowing	$4 50
Harrowing	3 00
Carried forward	$7 50

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Brought forward	$7 50
Sowing	50
Seed, 3 bushels, at $2.60	7 80
Reaping and binding	8 00
Hauling	3 00
Thrashing and cleaning	10 00
Interest on land at $200	28 00
Marketing crop	3 00
	$67 80

Credit.

88 bushels at $1.80 (market in Rochester)	$158 40
Straw	30 00
	$188 40
Net profit on 1.95 acres	$120 60

E. S. HAYWARD.
NATH. HAYWARD.

Zerah Rider, Cambridge, Washington county, exhibited sample of a crop of flax grown upon 2.12 acres of land. Expense of cultivation, &c., $131; receipts for seed, eighteen bushels sixteen pounds, $43.80; for flax, 1,280 pounds, $204.80; total, $248.60. Net profit, $117.60. Premium, fifteen dollars.

STATEMENT OF CULTIVATION.

CAMBRIDGE, WASHINGTON CO., N. Y., *February* 8, 1870.

The land on which this crop was grown is a slate loam, in pasture, and manured, the previous year, with twenty loads of barn-yard manure, spread on the surface and plowed in, and planted to corn, and cultivated in the usual way.

Expenses of Crop.

2 bushels seed	$6 00
Plowing, sowing and harrowing	6 00
Pulling flax, $24; drawing from the field, $3	27 00
Rippling and cleaning seed	7 00
Carting and spreading	8 00
Taking up flax and carting to mill	4 00
Interest on 2.12 acres of land	14 00
Dressing and marketing flax	64 00
	$131 00

Or.

18 16-54 bushels seed	$43 80
1,280 lbs. of flax, part sold at 16c.	204 80
	$248 60
Expenses	131 00
	$117 60

ZERAH RIDER

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Grain and Seeds.

Winter wheat—1. Ai Pine, Pittstown	$3 00
Winter wheat—2. W. P. Ottley, Phelps	2 00
Spring wheat—1. Ai Pine	3 00
Rye—1. H. Schoonmaker, Cedar Hill	3 00
Rye—2. J. H. Wayne, New Scotland	2 00
Rye—3. A. E. Van Alen, De Freestville	Trans.
Barley—1. Z. Rider, Cambridge	3 00
Oats—1. J. H. Wayne	3 00
Oats—2. A. E. Van Alen	2 00
Yellow corn—1. A. E. Van Alen	3 00
Yellow corn—2. Z. Rider	2 00

Two samples of very fine corn, shelled as usually prepared for seed (throwing out the butts and tips), were shown, the best by W. P. Ottley, the other by Ai Pine.

Large white beans—1. Ai Pine	$3 00
Small white beans—1. W. P. Ottley	3 00
Clover seed—1. W. P. Ottley	3 00
Flax seed—1. Ai Pine	3 00
Flax seed—2. Z. Rider	2 00
Buckwheat—1. H. Schoonmaker	3 00
Buckwheat—2. A. E. Van Alen	2 00

Very fair collections of winter vegetables were shown by Ai Pine (whose was the better one) and H. Schoonmaker.

Butter.

For 3 packages made at any time—1. M. E. Myers, Charlton	$15 00
For 3 packages made, 1 in June, 1 in August, 1 in November:	
1. M. E. Myers	15 00
2. Ai Pine	10 00
For a package of winter butter:	
1. M. E. Myers	5 00
2. Ai Pine	3 00

Cheese—(No Competition).

Best 3 cheeses, M. E. Myers	15 00

The judges have given Mr. Myers the first premium for three packages of butter made in June, August and November, because they could not separate the packages, but were required to consider the entry as a whole. They consider that Mr. Pine's June butter was the best offered, and that this is an evidence of great skill and success. They recommend the case for favorable consideration.

LEWIS JULIAND, Bainbridge.
S. S. WHITMAN, Little Falls.

Fruits.

20 varieties of apples:	
1. P. Van Wie, Bethlehem	$10 00
2. Ai Pine, Pittstown	5 00
10 varieties of apples—1. Peter Van Wie	5 00
Best dish of apples of one kind:	
1. P. Van Wie	S. S. M.
2. A. E. Van Alen, De Freestville	Trans.
Pears, 1 variety (Beurre Langelier)—1. O. B. Gridley, Deansville	S. S. M.

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Mr. J. M, Wilcox, of Three Mile Bay, Jefferson county, sent on for exhibition sixty varieties of choice apples, but neglected to forward the certificate required by the rules of the Society that they were grown by the exhibitor, and the judges were therefore precluded awarding him any premium, but recommend his display to the special consideration of the Executive Committee.

W. M. HOLMES, Greenwich.
S. T. TABER, Roslyn.

MISCELLANEOUS.

E. A. Wendell, of Albany, exhibited six show coops for poultry, which are very convenient for packing and carrying. The fowls exhibited in the coops were very good specimens of their several kinds.

V. P. Douw, of Albany, exhibited one Remington Steel Plow, two Philadelphia Lawn Mowers, Harrington's Seed Sower, the American Meat Cutter, and a Copper Strip Feed Cutter.

John D. W. Wemple, of Albany, showed two of his patent Refrigerators with Water Filter and Cooler. We recommend them as a very convenient and useful article.

RICHARD CHURCH, Belvidere.
SAMUEL FAILE, White Plains.

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TREASURER'S REPORT.

LUTHER H. TUCKER, *Treasurer, in account with* THE NEW YORK STATE AGRICULTURAL SOCIETY.

1869.	DR.	
Feb. 10.	Cash and securities of the United States on hand	$17,677 96
1870.		
Feb. 9.	Life memberships received during the past year	507 00
	Annual memberships rec'd during the past year	206 00
	State appropriation	1,706 25
	State appropriation for salary of Entomologist	1,000 00
	T. H. Faile, Esq., for special premium on horses	200 00
	State fair receipts	16,083 37
	Net avails of refreshment rental	500 00
	Net subscription from Elmira local committee	558 44
	Interest account	1,295 80
	Miscellaneous receipts	70 29
		$39,805 11
1870.	CR.	
Feb. 9.	Payments during the year closing this day, per schedules hereto annexed:	
	Premiums, &c., at annual meeting, per schedule A	$244 05
	Premiums, &c., of previous years, per schedule B	132 00
	Salary of Entomologist, Dr. Asa Fitch, per schedule C	1,000 00
	Salaries and traveling expenses, per schedule C	5,487 32
	Library and museum expenses, per schedule D	276 22
	Incidental expenses, per schedule E	391 96
	Postages account, per schedule F	484 18
	Printing and stationery, per schedule G	1,296 55
	Abortion in cattle investigation, per schedule H	626 75
	State fair expenses at Elmira, per schedule I.	5,675 88
	State fair premiums and premium expenses, per schedule K	6,212 75
		$21,827 66
	Cash and United States securities on hand at this date, February 9, 1870	17,977 45
		$39,805 11

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We, the undersigned, do hereby certify that we have examined the above accounts, and compared the same with the vouchers therewith presented, and find the same to be correct and that all the payments have been fully vouched for; also, that we have had exhibited to us the securities above mentioned, and the bank book showing the balance above stated.

WM. M. ELY,
JAMES GEDDES,
Auditing Committee

SAMUEL CAMPBELL, *President.*
T. L. HARISON, *Corresponding Secretary.*
Dated ALBANY, *Feb. 9th*, 1870.

SCHEDULE A.

Premiums, &c., at Winter Meeting.

1869.

M. E. Myers, premiums, per voucher 1	$35 00
O. Howland, premiums, per voucher 2	18 00
H. Weir, premiums, per voucher 3	16 00
Ai. Pine, premiums, per voucher 4	10 00
H. Schoonmaker, premiums, per voucher 5	10 00
P. Van Wie, premiums, per voucher 6	7 00
A. T. Heermance, premiums, per voucher 7	5 00
L. L. French, premiums, per voucher 8	4 00
W. G. Wayne, premiums, per voucher 9	3 00
A. E. Van Alen, premiums, per voucher 10	2 00
J. J. De Forest, premiums, per voucher 11	2 00
Delavan House, expenses of lecturer, per voucher 12	33 25
S. R. Earls, expenses and disbursements, per voucher 13	26 75
W. H. Bogart, clerk and reporter, per voucher 14	15 00
John L. Coon, services, per voucher 15	27 00
Jos. Weingarten, services, per voucher 16	5 00
N. Vanderloo, services, per voucher 17	5 00
Cultivator, advertising, per voucher 18	4 80
S. R. Earls, advertising, per voucher 19	2 25
S. R. Earls, advertising, per voucher 20	1 75
S. R. Earls, advertising, per voucher 21	2 25
Evening Journal, advertising, per voucher 22	3 00
H. Pine, premium, per voucher 23	1 00
Randall King, premium, per voucher 24	5 00
	$244 05

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SCHEDULE B.

Premiums, &c., of previous years.

Pollock & Weaver, premiums in 1868, per voucher 1	$18 00
L. D. Mitchell, expenses in 1868, per voucher 2	9 00
C. M. Tyler, expenses in 1868, per voucher 3	100 00
Randall King, premium in 1868, per voucher 4	5 00
	$132 00

SCHEDULE C.

Salaries, Clerk Hire, &c.

Dr. Asa Fitch, Entomologist, per vouchers 1 to 4	$1,000 00
B. P. Johnson, Recording Secretary, per vouchers 5 to 6	200 00
T. L. Harison, Corresponding Secretary, per vouchers 7 to 17	3,000 00
S. R. Earls, clerk at rooms, per vouchers 18 to 29	1,500 00
T. L. Harison, traveling expenses, per vouchers 30, 31	46 80
L. H. Tucker, Treasurer, per voucher 32	400 00
E. Nusbaum, services, vouchers 37, 38, 43, 44, 45, 46	120 00
E. Keays, services, vouchers 39 to 42	215 22
S. R. Earls, traveling expenses, voucher 47	5 30
	$6,487 32

SCHEDULE D.

Library and Museum Expenses.

S. R. Earls, Library, voucher 1	$1 00
S. R. Earls, Library, voucher 2	10 00
J. G. Mairs, Library, voucher 3	46 25
S. R. Earls, Library, voucher 4	6 00
J. A. Hurst, Museum, voucher 5	5 00
S. R. Earls, Library, voucher 6	4 00
S. R. Earls, Library, voucher 7	20 00
S. R. Earls, Library, voucher 8	13 60
L. Tucker & Son, Library, voucher 9	3 00
S. R. Earls, Library, voucher 10	1 50
C. Van Benthuysen & Sons, Library, voucher 11	6 63
S. R. Earls, Library, voucher 12	20 50
T. L. Harison, Library, voucher 13	31 94
S. R. Earls, Library, voucher 14	31 55
S. R. Earls, Library, voucher 15	29 93
S. R. Earls, Library, voucher 16	43 82
C. Van Benthuysen & Sons, Library, voucher 17	1 50
	$276 22

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SCHEDULE E.

Incidental Expenses.

John Garrett & Co., brass dating stamp, voucher 1	$12 00
T. L. Harison, incidentals, voucher 2	9 43
S. R. Earls, incidentals, voucher 3	48 07
S. R. Earls, incidentals, voucher 4	16 75
T. L. Harison, insurance, voucher 5	40 00
S. R. Earls, incidentals, voucher 6	83 19
S. R. Earls, incidentals, voucher 7	38 96
S. R. Earls, incidentals, voucher 8	29 90
S. R. Earls, desk, voucher 9	30 00
S. R. Earls, incidentals, voucher 10	2 65
S. R. Earls, incidentals, voucher 11	18 64
S. R. Earls, incidentals, voucher 12	8 80
S. R. Earls, incidentals, voucher 13	2 41
S. R. Earls, incidentals, voucher 14	5 33
S. R. Earls, incidentals, voucher 15	13 88
S. R. Earls, incidentals, voucher 16	18 00
S. R. Earls, express charges, voucher 17	9 25
S. R. Earls, express charges, voucher 18	1 70
S. R. Earls, express charges, voucher 19	3 00
	$391 96

SCHEDULE F.

Postages Account.

S. R. Earls, postages for month, voucher 1	$33 44
S. R. Earls, postages for month, voucher 2	22 86
S. R. Earls, postages for month, voucher 3	19 00
S. R. Earls, postages for month, voucher 4	19 22
S. R. Earls, postages for month, voucher 5	30 00
S. R. Earls, postages for month, voucher 6	51 23
S. R. Earls, postages for month, voucher 7	63 28
S. R. Earls, postages for month, voucher 8	30 00
S. R. Earls, postages for month, voucher 9	106 95
T. L. Harison, postages for month, voucher 10	39 80
S. R. Earls, postages for month, voucher 11	37 25
S. R. Earls, postages for month, voucher 12	15 00
S. R. Earls, postages for month, voucher 13	16 15
	$484 18

SCHEDULE G.

Printing and Stationery.

Chas. Van Benthuysen & Sons, voucher 1	$468 73
Thos. Groom & Co., voucher 2	23 15
Carried forward	$491 88

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Brought forward	$491 88
S. R. Earls, voucher 3	8 90
S. R. Earls, voucher 4	18 69
Chas. Van Benthuysen & Sons, voucher 5	386 40
S. R. Earls, voucher 6	12 25
Chas. Van Benthuysen & Sons, voucher 7	378 43
	$1,296 55

SCHEDULE H.

Abortion Investigation Expenses.

A. S. Copeman, services and expenses, voucher 1	$80 00
Dr. W. H. Carmalt, services and expenses, voucher 2	27 26
New York Printing Co., printing, voucher 3	16 00
Dr. B. R. Swan, services and expenses, voucher 4	212 12
Dr. G. A. Van Wagenen, services and expenses, voucher 5	137 32
C. Van Benthuysen & Sons, printing, voucher 6	154 05
	$626 75

SCHEDULE I.

State Fair Expenses at Elmira.

T. L. Harison, traveling expenses, voucher 1	$12 80
T. L. Harison, traveling expenses, voucher 2	9 33
T. L. Harison, traveling expenses, voucher 3	10 55
L. H. Tucker, traveling expenses, voucher 4	19 55
L. H. Tucker, traveling expenses, voucher 5	18 75
T. L. Harison, disbursements, voucher 6	81 00
S. R. Earls, disbursements, voucher 7	109 92
S. R. Earls, disbursements, voucher 8	21 70
H. Bowen, disbursements, voucher 9	46 25
J. C. Cuyler, disbursements, voucher 10	30 12
P. Ronan, carriage hire, voucher 11	65 00
C. T. Potter, carriage hire, voucher 12	20 00
J. H. Farrell, carriage hire, voucher 13	13 00
Charles Cross, carriage hire, voucher 14	12 00
Wm. Dawson, forage, &c., voucher 15	20 00
Merrill & Willis, forage, &c., voucher 16	7 60
John Schuyler, forage, &c., voucher 17	5 00
John Mitchell, water, voucher 18	10 00
Rowland & Beadle, water, voucher 19	3 00
M. D. Smith, labor, voucher 20	16 00
P. Gallagher, labor, voucher 21	12 50
J. B. Seley, labor, voucher 22	12 00
M. M. Robinson, labor, voucher 23	4 00
W. M. Ely, labor, voucher 24	1 25
Carried forward	$561 32

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Brought forward	$561 32	
E. C. Frost, floral hall expenses, voucher 25.	23 81	
Dutcher & Elmore, floral hall expenses, voucher 26	21 31	
James Field, use of tent, voucher 27	30 00	
Marshall & McCollom, flag, voucher 28	25 00	
Charles Van Benthuysen & Sons, printing bills, &c., voucher 29	828 67	
Earls for N. Goodwin, posting bills, &c., voucher 30	70 59	
H. C. Chamberlain, posting bills, &c., voucher 31	2 00	
S. R. Earls, stationery, voucher 32	67 58	
J. H. Farrell, stationery, voucher 33	7 25	
Rowland & Beadle, hardware, &c., voucher 34.	25 23	
Fairman & Thurston, printing voucher 35	38 85	
S. Haight, rooms and board, voucher 36	97 00	
S. H. Wadsworth, rooms and board, voucher 37	78 75	
T. L. Harison, rooms and board, voucher 38	42 25	
S. H. Wadsworth, rooms and board, voucher 39	30 00	
		$1,949 61
H. Bowen, general superintendent, voucher 40	$273 63	
S. W. Smith, assistant superintendent, voucher 41	60 00	
D. McCormick, horses for superintendent, voucher 42	40 00	
James S. McDonald, superintendent of cattle, voucher 43	60 00	
R. G. Wands, assistant superintendent of cattle, voucher 44	48 00	
John F. Quick, superintendent of horses, voucher 45	78 00	
F. Bowen, assistant superintendent of horses, voucher 46	42 00	
T. V. Maxon, superintendent of sheep and swine, voucher 47	60 00	
P. H. Peterson, assistant superintendent of sheep and swine, voucher 48	16 00	
A. M. Mosier, assistant superintendent of sheep and swine, voucher 49	8 00	
J. W. Smith, superintendent of implements, voucher 50	36 00	
W. McGowan, assistant superintendent of implements, voucher 51	60 00	
H. B. Bartlett, assistant superintendent of implements, voucher 52	30 00	
A. A. Sweet, assistant superintendent of implements, voucher 53	35 50	
Carried forward	$847 13	$1,949 61

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Brought forward	$847 13	$1,949 61
C. Boughton, superintendent of dairy hall, voucher 54	36 00	
J. L. Ingalsbe, superintendent of grain and vegetables, voucher 55	24 00	
W. Ottley, assistant superintendent of grain and vegetables, voucher 56	20 00	
W. M. Ely for Jarvis, domestic hall, voucher 57	36 00	
Ely for Soper, domestic hall, voucher 58	48 00	
E. C. Frost, superintendent floral hall, voucher 59	48 00	
E. Shelton, assistant superintendent floral hall, voucher 60	58 00	
E. Ingalls, assistant superintendent floral hall, voucher 61	16 00	
M. C. Remington, superintendent forage, voucher 62	60 00	
W. H. Bogart, superintendent press, voucher 63	30 00	
James Geddes, general supervision, voucher 64	150 00	
Hiram Segur, gate keeper, &c., voucher 65	60 00	
G. B. A. Whipple, gate keeper, &c., voucher 66	55 00	
G. W. Grant, gate keeper, &c., voucher 67	41 00	
E. W. Green, gate keeper, &c., voucher 68	40 00	
Daniel Cormick, gate keeper, &c., voucher 69	34 00	
L. H. Clowes, gate keeper, &c., voucher 70	33 00	
James Powers, gate keeper, &c., voucher 71	33 00	
W. G. Barnard, gate keeper, &c., voucher 72	30 00	
D. D. Tompkins, gate keeper, &c., voucher 73	28 00	
E. B. Van Cott, gate keeper, &c., voucher 74	28 00	
James Tompkins, gate keeper, &c., voucher 75	28 00	
George L. Davis, magistrate, voucher 76	42 00	
Thos. Dusenbury, detective, voucher 77	50 00	
John G. Tully, detective, voucher 78	50 00	
Dan'l Margensten, detective, voucher 79	42 00	
Jacob Emerick, detective, voucher 80	42 00	
Geo. N. Mitchell, detective, voucher 81	37 00	
N. McCormick, police, &c., voucher 82	37 00	
W. H. Scheu, police, &c., voucher 83	33 00	
Isaac C. Otis, police, &c., voucher 84	30 00	
C. D. Remington, police, &c., voucher 85	27 00	
Thomas Smith, police, &c., voucher 86	24 00	
G. W. Stoddard, police, &c., voucher 87	21 00	
Carried forward	$2,218 13	$1,949 61

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Brought forward	$2,218 13	$1,949 61
C. Chaffen, police, &c., voucher 88	18 00	
C. Kelbey, police, &c., voucher 89	18 00	
E. Bliven, police, &c., voucher 90	16 00	
O. Haskins, police, &c., voucher 91	15 00	
C. Dixon, police, &c., voucher 92	12 00	
Geo. R. Smith, police, &c., voucher 93	12 00	
M. A. Bell, police, &c., voucher 94	12 00	
J. G. Post, police, &c., voucher 95	12 00	
Ely for Bowles, police, &c., voucher 96	8 00	
P. E. McIntosh, police, &c., voucher 97	6 00	
B. D. Hale, police, &c., voucher 98	6 00	
O. M. Fletcher, police, &c., voucher 99	6 00	
C. W. Crosman, police, &c., voucher 100	6 00	
John McInnerry, police, &c., voucher 101	4 50	
R. M. Badger, police, &c., voucher 102	4 00	
		2,373 63
J. W. Smith, entry clerk before fair, voucher 103	$95 25	
J. W. Smith, entry clerk, before fair, voucher 104	78 73	
J. C. Cuyler, business office, voucher 105	100 00	
S. A. Bunce, business office, voucher 106	64 00	
Cyrus Hayden, business office, voucher 107	64 00	
G. W. Bliss, Jr., business office, voucher 108	64 00	
C. F. Williston, business office, voucher 109	64 00	
J. K. Seaver, business office, voucher 110	56 00	
E. Nusbaum, business office, voucher 111	10 00	
J. L. Coon, general services and expenses, voucher 112	106 56	
N. Goodwin, president's office, voucher 113	45 00	
T. R. Goodwin, superintendent's office, voucher 114	27 00	
		774 54
T. W. Cantwell, services ticket office, voucher 115	$40 00	
John H. Farrell, services ticket office, voucher 116	40 00	
B. Brumaghim, services ticket office, voucher 117	30 00	
W. G. Tucker, services ticket office, voucher 118	30 00	
L. T. Milligan, services ticket office, voucher 119	25 00	
W. W. Harris, services ticket office, voucher 120	20 00	
E. F. Hackett, services ticket office, voucher 121	20 00	
J. T. Maher, services ticket office, voucher 122	20 00	
Carried forward	$225 00	$5,097 78

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Brought forward	$225 00	$5,097 78
Geo. A. Burr, services ticket office, voucher 123	20 00	
C. F. Emery, services ticket office, voucher 124	15 00	
S. T. Fine, services ticket office, voucher 125.	15 00	
H. C. Milligan, services ticket office, voucher 126	15 00	
R. A. Davis, services ticket office, voucher 127	15 00	
E. McCammon, services ticket office, voucher 128	10 00	
Rural New Yorker, advertising, voucher 129.	93 75	
S. R. Earls, advertising, voucher 130	39 65	
S. R. Earls, advertising, voucher 131	17 20	
S. R. Earls, advertising, voucher 132	10 50	
Troy Times, advertising, voucher 133	20 00	
J. J. & T. K. Seaver, advertising, voucher 134	4 00	
S. R. Earls, advertising, &c., voucher 135	57 50	
J. C. Cuyler, advertising, &c., voucher 136..	15 50	
S. R. Earls, advertising, voucher 137	5 00	
		578 10
		$5,675 88

SCHEDULE K.

Premiums and Premium Expenses.

Ezra Cornell, premiums, class one, voucher 1	$125 00
W. Crozier, premiums, class one, voucher 2	105 00
Woolcott & Campbell, premiums, class one, voucher 3	100 00
Walter Cole, premiums, class one, voucher 4	95 00
W. E. Arnold, premiums, class one, voucher 5	65 00
Geo. Butts, premiums, class one, voucher 6	65 00
O. Howland, premiums, class one, voucher 7	50 00
Robert Bell, premiums, class one, voucher 8	40 00
Brodie & Son, premiums, class one, voucher 9	40 00
A. B. Benham, premiums, class one, voucher 10	35 00
Ira Young, premiums, class one, voucher 11	30 00
E. C. Holden, premiums, class one, voucher 12	30 00
L. F. Palmer, premiums, class one, voucher 13	25 00
W. Blanshard, premiums, class one, voucher 14	25 00
Benj. Fellows, premiums, class one, voucher 15	20 00
Thos. Gould, premiums, class one, voucher 16	20 00
Lane & Pumpelly, premiums, class one, voucher17	20 00
John C. Wells, premiums, class one, voucher 18	15 00
J. W. Wadsworth, premiums, class one, voucher 19	15 00
J. J. Hoyt, premiums, class one, voucher 20	15 00
R. B. Wilbers, premiums, class one, voucher 21	15 00
Carried forward	$950 00

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Brought forward	$950 00
Jonas Sayre, premiums, class one, voucher 22	10 00
C. W. Wadsworth, premiums, class one, voucher 23	10 00
John Chadwick, premiums, class one, voucher 24	10 00
C. K. Ward, premiums, class one, voucher 25	10 00
C. H. Roy, premiums, class one, voucher 26	10 00
W. W. Mason, premiums, class one, voucher 27	5 00
A. B. Raynor, premiums, class one, voucher 28	5 00
J. J. Gallup, premiums, class one, voucher 29	5 00
S. D. Hungerford, premiums, class one, voucher 30	94 00
M. P. Fitch, premiums, class one, voucher 31	15 00
Lewis G. Morris, premiums, class two, voucher 32	286 00
Geo. I. Pumpelly, premiums, class two, voucher 33	55 00
A. J. Bennett, premiums, class two, voucher 34	33 00
E. W. Taylor, premiums, class two, voucher 35	30 00
John H. Bell, premiums, class two, voucher 36	30 00
H. Vosburgh, premiums, class two, voucher 37	20 00
D. B. Irwin, premiums, class two, voucher 38	20 00
W. Ennis, premiums, class two, voucher 39	20 00
I. N. Spencer, premiums, class two, voucher 40	20 00
C. W. Wadsworth, premiums, class two, voucher 41	15 00
Cayuga Chief Manufacturing Co., premiums, class two, voucher 42	15 00
B. J. Stryker, premiums, class two, voucher 43	15 00
B. Lee, premiums, class two, voucher 44	15 00
T. S. Armstrong, premiums, class two, voucher 45	15 00
H. T. Johnson, premiums, class two, voucher 46	15 00
John E. Wood, premiums, class two, voucher 47	15 00
W. Dean, premiums, class two, voucher 48	10 00
T. Clarke, premiums, class two, voucher 49	10 00
Dodge & Stevenson Manufacturing Co., premiums, class two, voucher 50	10 00
J. C. Todd, premiums, class two, voucher 51	10 00
W. Gustin, premiums, class two, voucher 52	10 00
G. H. Post, premiums, class two, voucher 53	10 00
L. C. Bennett, premiums, class two, voucher 54	10 00
W. Bartlett, premiums, class two, voucher 55	10 00
L. B. Falkner, premiums, class two, voucher 56	10 00
J. N. Macomb, Jr., premiums, class two, voucher 57	9 00
Mrs. Wadsworth, premiums, class two, voucher 58	5 00
G. H. Fake, premiums, class two, voucher 59	5 00
D. B. Stryker, premiums, class two, voucher 60	5 00
H. Mix, premiums, class two, voucher 61	5 00
Lee Weller, premiums, class two, voucher 62	5 00
M. P. Fitch, premiums, class two, voucher 63	5 00
H. Schoonmaker, premiums, class two, voucher 64	4 00
W. Chamberlain, premiums, class three, voucher 65	104 00
Wolcott & Campbell, premiums, class three, voucher 66	78 00
Carried forward	$2,058 00

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Brought forward	$2,058 00
Robt. Bell, premiums, class three, voucher 67	58 00
Clark & McLean, premiums, class three, voucher 68	53 00
Brunson & Mariner, premiums, class three, voucher 69	48 00
J. D. Wing, premiums, class three, voucher 70	45 00
O. Howland, premiums, class three, voucher 71	45 00
Jurian Winne, premiums, class three, voucher 72	42 00
John Lynch, premiums, class three, voucher 73	41 00
Jos. Harris, premiums, class three, voucher 74	38 00
P. & G. F. Martin, premiums, class three, voucher 75	33 00
Ezra Cornell, premiums, class three, voucher 76	33 00
Carl Heyne, premiums, class three, voucher 77	32 00
T. T. Cavanagh, premiums, class three, voucher 78	29 00
E. A. Wendell, premiums, class three, voucher 79	29 00
Brodie & Son, premiums, class three, voucher 80	24 00
J. Y. Bicknell, premiums, class three, voucher 81	19 00
A. L. Thomas, premiums, class three, voucher 82	19 00
Wm. Crozier, premiums, class three, voucher 83	16 00
G. H. Warner, premiums, class three, voucher 84	12 00
Charles Stone, premiums, class three, voucher 85	12 00
H. C. Gavitt, premiums, class three, voucher 86	12 00
F. W. Dounce, premiums, class three, voucher 87	5 00
D. C. Brown, premiums, class three, voucher 88	5 00
C. S. White, premiums, class three, voucher 89	3 00
W. J. Roy, premiums, class three, voucher 90	3 00
Benj. Fellows, premiums, class three, voucher 91	3 00
R. Gibson, premiums, class three, voucher 92	3 00
John Haven, premiums, class three, voucher 93	3 00
James Ewing, premiums, class four, voucher 94	50 00
Williamsport Fork Company, premiums, class four, voucher 95	23 00
Noble Manufacturing Company, premiums, class four, voucher 96	20 00
J. G. Burritt, premiums, class four, voucher 97	10 00
John Taylor, premiums, class four, voucher 98	10 00
J. Byrne & Son, premiums, class four, voucher 99	5 00
Taber & Martin, premiums, class four, voucher 100	5 00
L. Bolles, premiums, class four, voucher 101	5 00
J. W. Penfield, premiums, class four, voucher 102	5 00
H. J. Edwards, premiums, class four, voucher 103	5 00
Herald & Andrews, premiums, class four, voucher 104	5 00
Robert Mann, premiums, class four, voucher 105	5 00
Andrews & Burbage, premiums, class four, voucher 106	5 00
G. M. Conley, premiums, class four, voucher 107	5 00
A. Strader, premiums, class four, voucher 108	3 00
M. E. Myers, premiums, class five, voucher 109	80 00
J. S. Holbert, premiums, class five, voucher 110	65 00
P. Miller, premiums, class five, voucher 111	55 00
Carried forward	$3,084 00

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Brought forward	$3,084 00
H. Graves, premiums, class five, voucher 112	45 00
Mrs. W. H. Graves, premiums, class five, voucher 113	44 00
R. E. Moss, premiums, class five, voucher 114	32 00
H. C. Hoffman, premiums, class five, voucher 115	25 00
B. C. Trumble, premiums, class five, voucher, 116	20 00
Mrs. B. A. Thomas, premiums, class five, voucher 117	19 00
F. W. Collins, premiums, class five, voucher 118	15 00
H. Schoonmaker, premiums, class five, voucher 119	15 00
D. Bentley, premiums, class five, voucher 120	15 00
A. B. Benham, premiums, class five, voucher 121	14 00
W. Simpson, Jr., premiums, class five, voucher 122	10 00
A. R. Frost, premiums, class five, voucher 123	10 00
Merrill & Willis, premiums, class five, voucher 124	10 00
W. Newton, premiums, class five, voucher 125	10 00
Lewis Fitch, premiums, class five, voucher 126	10 00
Charles Evans, premiums, class five, voucher 127	10 00
M. H. Ottley, premiums, class five, voucher 128	5 00
E. D. Roe, premiums, class five, voucher 129	5 00
T. S. Frost, premiums, class five, voucher 130	5 00
Guy Gray, premiums, class five, voucher 131	5 00
R. R. Moss, premiums, class five, voucher 132	5 00
Laura Hathorn, premiums, class five, voucher 133	4 00
M. Harrington, premiums, class five, voucher 134	3 00
John McCoun, premiums, class five, voucher 135	3 00
Mrs. W. L. Stryker, premiums, class five, voucher 136	3 00
Mrs. J. J. Hoyt, premiums, class five, voucher 137	3 00
J. S. French, premiums, class five, voucher 138	3 00
Hannah Rockwell, premiums, class five, voucher 139	3 00
Mrs. H. Seeley, premiums, class five, voucher 140	3 00
Mrs. Laura Gregory, premiums, class five, voucher 141	3 00
A. D. Griswold, premiums, class five, voucher 142	3 00
Geo. Chamberlain, premiums, class five, voucher 143	3 00
Abigail Booth, premiums, class five, voucher 144	2 00
Nancy Rockwell, premiums, class five, voucher 145	2 00
Mrs. O. C. Dounce, premiums, class five, voucher 146	2 00
Miss Hall, premiums, class five, voucher 147	2 00
Kittie A. Moody, premiums, class five, voucher 148	2 00
Ellwanger & Barry, premiums, class six, voucher 149	90 00
C. W. Crosman, premiums, class six, voucher 150	80 00
James Vick, premiums, class six, voucher 151	44 00
Mrs. Humphrey, premiums, class six, voucher 152	31 00
Jos. R. Conklin, premiums, class six, voucher 153	18 00
John H. Bell, premiums, class six, voucher 154	17 00
G. C. Wickham, premiums, class six, voucher 155	15 00
Geo. Evender, premiums, class six, voucher 156	14 00
J. W. Clark, premiums, class six, voucher 157	6 00
Hasbrouck & Bushnell, premiums, class six, voucher 158	2 00
Carried forward	$3,774 00

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Brought forward	$3,774 00
B. H. Andrews, services, &c., as judge, class one, voucher 159	25 48
Wm. Birnie, services, &c., as judge, class one, voucher 160	25 00
Thos. Bell, services, &c., as judge, class one, voucher 161	23 00
David Christie, services, &c., as judge, class one, voucher 162	22 00
C. T. Hulburd, services, &c., as judge, class one, voucher 163	20 00
D. B. Haight, services, &c., as judge, class one, voucher 164	21 25
T. J. Hand, services, &c., as judge, class one, voucher 165	21 10
Jos. Juliand, 2d, services, &c., as judge, class one, voucher 166	9 60
A. B. Raymond, judge in class two, voucher 167	19 50
B. A. Sweet, judge in class two, voucher 168	13 40
Hugh Heustis, judge in class three, voucher 169	20 90
M. C. Weld, judge in class three, voucher 170	19 00
S. S. Whitman, judge in class three, voucher 171	17 00
H. Callanan, judge in class three, voucher 172	13 40
R. H. Avery, judge in class three, voucher 173	13 30
P. H. Peterson, judge in class three, voucher 174	9 00
Geo. Tweddle, judge in class three, voucher 175	8 40
Wm. Dunlop, judge in class three, voucher 176	8 00
O. F. Marshall, judge in class three, voucher 177	6 75
S. W. Baldwin, judge in class four, voucher 178	27 50
H. Waterman, judge in class four, voucher 179	24 90
R. H. Van Rensselaer, judge in class four, voucher 180	9 40
O. K. Rice, judge in class five, voucher 181	27 60
H. Lewis, judge in class five, voucher 182	18 10
J. H. Graham, judge in class five, voucher 183	15 00
C. B. Way, judge in class five, voucher 184	12 52
W. H. Watson, judge in class five, voucher 185	12 20
L. F. Allen, judge in class five, voucher 186	11 50
E. Harper, judge in class five, voucher 187	11 00
S. O. Dean, judge in class five, voucher 188	11 00
J. E. Ely, judge in class five, voucher 189	8 50
C. L. Allen, judge in class six, voucher 190	20 00
John Sloan, judge in class six, voucher 191	13 40
S. J. Parker, judge in class six, voucher 192	8 50
A. Whitney, judge in class six, voucher 193	5 00
C. Van Benthuysen & Sons, catalogues, voucher 194	714 26
C. Van Benthuysen & Sons, premium lists &c., voucher 195	480 89
R. Godley, judges and other badges, voucher 196	65 08
Mrs. J. T. Van Namee, premiums, voucher 197	58 00
J. Y. Bicknell, premiums, voucher 198	15 00
Carried forward	$5,659 43

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Brought forward	$5,659 43
Geo. Hegeman, bill of medals, voucher 199	515 32
G. E. Stanley, premiums, voucher 200	8 00
H. C. Gavit, premiums, voucher 201	15 00
J. E. Morgan, premiums, voucher 202	5 00
S. R. Earls, engraving medal, voucher 203	1 00
C. Van Benthuysen & Sons, certificates of merit, voucher 204	9 00
	$6,212 75

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ADDRESS

DELIVERED BEFORE THE NEW YORK STATE AGRICULTURAL SOCIETY, AT ALBANY, ON WEDNESDAY EVENING, FEBRUARY 9TH, 1870.

By Professor James Law, of Cornell University, Ithaca, N. Y.

Mr. President and Gentlemen:

The present age is essentially a utilitarian one. It discards many barren, speculative pursuits of former times for those which directly contribute to the triumphs of human intellect over the forces of nature, and seeks to inaugurate an era of universal civilization and happiness. We have not yet, however, arrived at the goal of our aspirations. It is true, we have girdled the world with railroads, steamboats and telegraphs, bringing the contributions of all nations to minister to our physical and intellectual wants; and we have lessened the fatigue of toiling millions by substituting for worn fingers and wearied muscles, the machine of admirable conception and design, and the all conquering power of steam. But, as yet, we come far short of the possible, in annihilating the sad list of human ills. Our Union Pacific railroad, that greatest engineering work of modern times, reached not its completion without the immolation of its martyrs on the altar of human progress. No railroad track of any moment passes a year without offering up its human sacrifices as the price of the immeasurable advantages it grants to the traveling public. No large building, no great seat of learning is erected, but the remorseless demon of destruction exacts from his sworn enemies his human victims as the purchase of material and intellectual advancement. But if we have not yet acquired the power to avoid the lesser evils in the attainment of the greater good, we have, at least reached this point of advancement, that we no longer seek to attain the desired object by inadequate and irrational means. We now demand of science that, while inaugurating great reforms, she shall also devote her best energies and her higher powers to the protection of the humble toilers in her grand reformations.

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In darker ages, men sought for personal safety, as well as the protection of their flocks and herds, in charms, amulets and invocations, remnants of which are to be found, even in civilized communities, to the present day. But the reliance on the charmed blade has given place to the perfect finish and accurate bore of the rifle; the belief in the efficacy of human sacrifices to appease the angry gods in time of pestilence has been replaced to better purpose by a confidence in the draining of marshes, the better cleansing of towns and hamlets, and the destruction, by disinfectants, of morbid contagia; the written charm or sign, and the treasured amulet, have resigned their sway to the study and control of those natural laws which a gracious Providence has placed at our hands, and by which we are empowered to ward off myriad ills whose causes were at once mysterious and terrible to our forefathers.

But as man is constituted a religious animal, so with imperfect knowledge he must remain more or less a superstitious one. And, as if the lower animals were doomed to be the last victims of such delusions, we see them still cropping up, at frequent intervals, in the management of live stock. The Irish or French peasant whose herd has been attacked by an epizootic, threatening their destruction, reverently calls in the parish priest and has him say mass over the victims. And while he may seek to excuse himself on the strength of his religious feelings, we cannot but pity the delusion which appeals to the Almighty for protection while neglecting those certain measures of prevention which God has placed in his own power.

On many stable doors in Great Britain we see nailed up a horse shoe, and though in many cases this is only done as the result of habit, and with no conception on the part of the doer of its primary significance, it was confidently relied on in former times to debar evil spirits and diseases from the premises. One of the most extraordinary superstitions was that which attached to the *bezoar* or *egagropile*. Here a stone, or calculus, formed by deposit from the animal fluids in some internal organ, and which had in many cases caused the death of its host, was eagerly sought after and purchased, at ten times its weight in gold, as a prophylactic against contagion.

Nor is this highly favored country, with its admirable provisions for securing an education to all its citizens, its advanced Christianity, and its ingenious and progressive people, entirely free from such delusions. I have repeatedly postponed surgical operations until the proprietor of the animal has assured himself that the astronomical signs were favorable, and have been seriously consulted about the propriety

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of putting away in a dry place the object removed with the knife, that a satisfactory recovery might be ensured.

In themselves, these superstitions and delusions are harmless enough, and might be treasured as mementos of a credulous and imaginative past, but as they all tend to distract attention from the real dangers of each particular case, and the precautions necessary, they ought to be forever discarded. It is not among the members of this old and intelligent Society that such delusions can find a resting place, yet it is no less the duty of every member to disabuse the mind of any neighbor less favored in an educational point of view. The mass or *bezoar* will not harm the plague-stricken animals, but they divert attention from the all important separation of healthy and diseased, and from the cleansing and disinfection so essential to the checking of the malady. The waiting for a favorable influence of the stars, and the particular disposal of the excised fleshy mass, may be a matter of indifference as regards the result, but the postponement of a surgical operation from favorable weather to a tempestuous season, and the preservation of a mass of putrifying animal matter in the same stable in which the wounded animal stands, are among the best possible means to secure unhealthy action, or even gangrene, in the sore.

There are certain other delusions, entertained by many stock owners, which cannot claim even the poor excuse of superstition. These refer mainly to *hollow-horn*, *horn-ail*, *tail-ail*, and *black-tooth*. I would not venture to mention these redoubtable ailments, but for the unaccountable prevalence of the inhuman practices resorted to for their cure, and while I indulge the hope that no member of the New York State Agricultural Society may have been guilty of the barbarities alluded to, I trust that my words may come under the notice of others who have unwittingly and against their better natures been led astray by the prevailing errors.

Some one has said that *horn-ail* is a truly national disorder, and such it may justly be held, inasmuch as in no other country do cattle require to have their horns perforated with gimlet holes, and stuffed and rubbed with heating agents, to restore them to soundness. But what is the true state of the case? In all countries alike, the horn is hollow in the healthy, full grown animal. But instead of this hollow condition proving a source of trouble, it adds to the comfort of the animal, and, indeed, is almost essential to its existence. In the young and growing calf, the framework of the skull is to a large extent membranous, and hence lighter than a bony structure of the same size would be. But as earthy salts are deposited in these membranes, and

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as they are transformed into true bone, the weight of the head is correspondingly increased, and without some compensating device would become an unwieldy burden. To obviate this, the Divine Architect establishes a process of excavation in the bony mass, which separates the inner layer from the outer, and leaves between a hollow cavity which communicates freely with the nostrils. As development proceeds, as the head increases in bulk, and as the framework of the skull becomes more exclusively bony, there advances in equal ratio the process of excavation, until over the entire forehead the inner and outer plates of bone become reduced to, comparatively, mere shells, with a wide and open intervening cavity. This scooping out process extends for some distance over the ridge forming the summit of the head, and into the conical bony supports of the horns, as well as downward in front of each eye and deeply into the center of the skull beneath the cranium, so that all the otherwise heavy parts are attenuated and lightened, and while the head maintains its massiveness and symmetry, the animal can use it with ease, and even with gracefulness. Nor is it lightness and symmetry alone that are secured by this arrangement. As the outer plate is connected with the inner by delicate pillars of bone, possessing, as all bone does, a certain amount of elasticity, we have here interposed between this outer plate of bone and the brain, a most admirable means of warding off from this vital organ those concussions to which the forehead and horns are of necessity subjected when used as weapons, offensive or defensive. The forehead, moreover, by this peculiarity in structure, similar in some respects to the plates of iron ships bent over at right angles at their borders to increase their power of resistance, acquires a strength altogether disproportionate to the amount of bony matter employed in its construction. The whole condition, then, of hollow face and hollow horn, in place of demanding to be combated by cruel surgical operations, presents to him who will view it aright one of the most beautiful examples of creative wisdom, in the adaptation of means to ends at once so varied and so vital.

In the young calf and growing animal, then, a hollow horn is not a natural condition, but as it increases in size its bony support becomes scooped out internally, and the older the animal the larger becomes this internal cavity and the thinner the investing plate of bone. In cases of inflammation of the lining membrane of this cavity, from severe catarrh, or from direct injury when the yoke is attached to the horns, the cavity alike of the horn and the forehead may be filled up with matter, which finds only a slow and imperfect exit by the nose.

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But this is manifestly a condition diametrically opposed to *hollow-horn*, and is moreover a very rare affection. A disease of this kind is recognized by the discharge from the nose of whiteish or yellowish matter, and sometimes of pure blood, by the heat and tenderness of the root of the horns and forehead, by the hanging head, the partially closed eyes, the great dullness and listlessness and by the absence of a hollow sound when the forehead is gently tapped with the tip of the middle finger. It demands as treatment absolute rest, a dose of opening medicine, a semi-liquid, non-stimulating diet, the application of cold water, or even hot fomentations, steadily maintained, to the forehead, steaming of the nostrils by hot water vapor, and in obstinate cases the opening of the cavity in the interval between the eyes, and the syringing of it out daily with a mild astringent lotion until a healthy action has been established. But this disorder will never warrant the boring of the horns with a gimlet. If the horn were cut off by the root, as is done by a certain French author, the act *might* be defended on the ground of utility, but the boring of the horns entails great suffering without the slightest advantage, and if indefensibly cruel and hurtful in the diseased state of the parts, how much more so in the healthy?

But let me draw attention for a moment to the utter cruelty, uselessness and injury of this practice. First, note the structures involved in the gimlet wound. Beneath the horn, which is insensible to pain, there are, first, the highly sensitive and unyielding fibrous layer and its vascular folds, by which the horn is so firmly bound to the supporting bony process. Next there is the spongy, vascular and sensitive bone, with its outer and inner nutrient fibrous membranes. And lastly, the delicately sensitive mucous membrane, which lines the cavity of the bony process and the forehead. All of these vascular structures, with the exception of the mucous membrane, have a very close and resistant texture, and do not readily yield to exudation and swelling, so that inflammation seated in them is associated with exquisite pain. This suffering is increased by the compression of the inflamed parts by the investing and unyielding horn. The rude tearing of these tender and susceptible structures by the gimlet can scarcely fail to set up inflammation, and an amount of attendant pain and suffering which may be partially appreciated by those who have had a *whitlow* under the finger nail. To those who have suffered from this, I need not appeal against the cruelties practiced for the imaginary *horn-ail*. But the ox suffers more than the human being because of the close proximity of the disease to more vital parts, and

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because the structures are of a closer texture and yield less readily to exudation than in the case of the human finger. The exudations and matter pent up between the unyielding bone below, the resistant horn above, and the dense fibrous structures around, are only too well calculated to produce excruciating agony. The tearing of these sensitive structures, and the rubbing in of pepper and other irritants, might be truthfully branded as fiendish, but that the act is the offspring of ignorance, and practiced, however mistakenly, as a means of cure.

But after all, what is the condition known as *horn-ail?* In seeking to answer that question I have gone into the history of the disease, and find that it first occurred in 1771, as an epizootic, in the neighborhood of Boston. Mr. Cotton Taffts thus describes it in the first volume of "Memoirs of the American Academy of Science," page 529: "In 1771, a mortal distemper prevailed among foxes, and greatly reduced their numbers. About this time, or not long after, a distemper appeared among neat cattle, which destroyed many, and has continued to this day. The distempers that befell these various kinds of animals were said not to have been known in the country before, more especially that which has affected neat cattle, and which has generally been considered as a new disease. It is commonly called the *horn distemper.* Cows are more especially subject to it; oxen but seldom; bulls are said to be exempt from it, also steers and heifers under three years of age. It is a disease which affects the internal substance of the horn, commonly called the pith, insensibly wastes it, and leaves the horn hollow. The pith is a spongy bone, whose cells are filled with an unctuous matter; it is furnished with a great number of small blood-vessels, is overspread with a thin membrane, and appears to be united by suture to the bones of the head, and is projected to a point. This spongy bone, in the *horn distemper*, is sometimes partly and sometimes entirely wasted. The horn loses its natural heat, and a degree of coldness is evident upon handling it. When it is only in one horn (which is often the case), a manifest difference between the one and the other will be perceived, and in all cases a want of natural heat will be apparent. Wherever this is found, there is no room to doubt of the disorder being present, yet it is seldom suspected without a particular acquaintance with other symptoms that commonly attend this distemper; and for want of knowing these the farmer has often lost his cattle, not even suspecting the evil. The symptoms are, a dullness in the countenance of the beast, a sluggishness in moving, a heaviness

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of the eyes, a failure of appetite, an inclination to lay down, an aversion to rise, and, when accompanied with an inflammation of the brain, a giddiness and frequent tossing of the head; besides, the limbs are sometimes affected with stiffness like a rheumatism, and in cows the milk often fails, the udder is hard, and in almost all cases there is a sudden wasting of the flesh." He adds: "(Neat cattle are subject to a disorder commonly called the *tail-sickness*, which is a wasting of the bony substance of the tail; and if not cut off, or dilated as far as the defect reaches, often proves fatal. It frequently accompanies the horn distemper.) From the number of cows seized by this distemper in the space of a fortnight, a suspicion arose that the distemper was infectious. Time, however, has shown that it is not so, at least in any great degree; for it frequently happens that among many cattle herding together, one of them shall have the distemper and the others shall remain in perfect health." He goes on to describe the cure of the disease by the now time-honored *gimlet* surgery.

Our knowledge of the disease has not advanced since the days of Cotton Taffts. From all available descriptions of the malady, and from the numerous cases that have been shown me, I can learn of no specific symptom, in addition to those of general ill health, but extreme coldness or warmth of the horns. To enable us to appreciate the importance of these symptoms, let us note the following facts: The vascular structures beneath the horn, like those of the skin generally, wherever an abundance of epidermic productions are secreted, are very abundantly supplied with blood. This applies alike to the human scalp, the heels of the heavy breeds of horses, or the structures secreting the nails of man, the claws of carnivora, the hoof of the horse, or the horns of cattle. From this abundance of blood the horns participate in all the changes of temperature experienced by the blood and body at large, and their excessive heat affords conclusive evidence of the existence of fever. But as they are superficial structures, they equally participate in the chill or shivering fit by which the fever is ushered in, and when the blood is repelled from the contracted vessels in the integument to accumulate around internal organs. The coldness of the horn, then, is merely a concomitant of that of the skin when fever is being manifested by its first outward symptom, a chill or staring coat. Unnatural heat of the horn is equally an exponent of a morbid rise of temperature in the blood and body at large, a constant and essential condition of fever. Alterna tions from heat to cold, and the reverse, on the part of the horns, like

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corresponding changes in the skin generally, will take place at frequent intervals during the progress of many diseases.

Having thus arrived at the general morbid condition betokened by the coldness or heat of the horns, it remains to note other specific symptoms which will denote the precise nature of the disease. But these symptoms are as varied as the febrile and inflammatory disorders of the animal, so that it were vain to attempt to enumerate them here. And yet it is upon the observation and recognition of these specific symptoms alone that a rational treatment can be based. To note a few, by way of illustration, in themselves generic and pointing to disease of special organs rather than to particular diseases, I mention the following: There may be dullness, stupor, or somnolence, or extreme excitability, restlessness, or wildness of look. There may be slight twitching of the muscles. There may be cramps or convulsions, or more or less complete loss of sensation or voluntary movement, all pointing to diseases of the brain or nervous centers. There may be disturbed breathing, red injected nostrils, hot expired air, swelling of the throat, dryness of the nose or watery discharge from it, cough, grunting with each expiration or when some particular part of the chest is struck, together with modifications of the natural sounds and resonance of the chest, pointing to disease of the respiratory organs. There may be an absence of these symptoms, but a suspension of rumination, impaired appetite, swelling on the left side of the belly, uneasy movements of the hind limbs and tail, and an unnatural state of the dung as regards liquidity or dryness, frequency of escape or infrequency, or a chopped up, undigested appearance, all indicating some disorder of the digestive organs. The epizootic of Taffts was probably a digestive disorder, with symptomatic brain disease, as manifested in the stiffness and loss of control over the limbs, the great dullness, and the violent movements of the head. Color is lent to this supposition by the facts that the year 1771 was unusually wet and stormy, and marked by the prevalence of many diseases among men and animals in different parts of the world. Thus, ergotism was general throughout Europe. In Germany bilious fever was very fatal in man, an abdominal disorder in the horse, and large numbers of geese, pheasants and wild animals died. In Holland, Belgium and France an epizootic of gangrenous sore throat devastated the cattle. In Spain they suffered from a fatal dysentery. In Russia, from the cattle plague, and in the West Indian islands man and beast alike suffered from a malignant blood disease. The deteriorated fodder of such a year was very likely, indeed, to induce disor-

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ders of the digestive organs and of the brain. To return to the general symptoms. There may be yellowness of the eyes and nose, lying on the right side, grunting when struck on the last ribs on that side, and perhaps lameness in the right fore leg in an overfed and inactive animal, bespeaking disease of the liver. There may be arching and tenderness of the loins, an unsteady or straddling gait with the hind extremities, uneasy movements of the hind limbs and tail, frequent attempts to urinate, the passage of water in small quantities, high colored, or even bloody, showing disease of the urinary organs. I might proceed, but I will only seek to advise a treatment to be adopted during the shivering and the coldness of the horn, that will be at once more rational and more successful than the boring and peppering process.

If the animal is chill, shivering, or has a rough, staring coat, and if the horn is unnaturally cold, a dangerous inflammation may often be warded off by bringing about a free circulation and warmth in the skin. Give an injection of three quarts of warm water, repeating it if it is thrown off. Administer by the mouth several quarts of warm gruel, containing six or eight ounces of whiskey, brandy or gin, or if obtainable, four ounces of sweet spirits of nitre, or five drachms of carbonate of ammonia. Blanket the patient warmly from head to tail, and actively hand-rub the limbs. A good plan is to heat dry bran, salt or sand in a stove, put it in a broad, lengthy bag, and lay it along the beast's spine from shoulder to rump. Or wring a thick rug out of very hot water, lay it over the animal's back from head to tail, cover it up with several dry rugs or buffalo skins, and bind them closely to the skin with surcingles, that the heat may be retained. The limbs may, meanwhile, be actively rubbed, and then tied up in warm flannel bandages, loosely applied, so as not to impede the circulation. In half an hour the patient will usually be in a glow of warmth, and covered with perspiration, and the coverings must be removed gradually, one by one, and the damp one quickly replaced by an ample dry one, after one and a half to two hours Dangerous inflammations in the chest, abdomen, &c., may often be warded off by these measures, when taken in the initial stage, and though a little more troublesome than the gimlet surgery, it has the compensating claims of being at once rational and successful. Such measures are, of course, only applicable at the commencement of the disease, when, as yet, no important change of structure has taken place, but when there is an impaired vitality of some internal organ, and when the blood is being repelled from the surface to accumulate injuriously or

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fatally around this and other deep seated structures The same success must not be looked for from such measures applied during the slight and frequently alternating chills and flushes of the surface, which so often manifest themselves during the course of a severe inflammation, or after the diseased organ has become the seat of important structural changes. When the first chill or shiver has passed off, and when inflammation of an important organ has been fully established, other remedies must be employed, in the shape of counter-irritants and medicinal agents, as varied as the diseases, or even as the different types, phases or stages in individual cases of illness. To treat of these would acquire a volume, rather than a short address.

Tail-ail is closely allied to *horn-ail* in attacking the stock of ignorant and credulous owners, and in the measures to be adopted for its cure. Like that disease, it is further the peculiar prerogative of horned cattle. The caudal appendages of horses, dogs, pigs, and even of sheep are exempt from this formidable malady. It is not, however confined to the New World, but lays claim to all the respect with which the hoary antiquity of European prejudices and practice may invest it. It would appear as if, the world over, the useful cow is doomed to have her tail slit, and the sore rubbed with salt, soot, pepper, &c. The supposed softening of the end of the tail is due to a piece of pliable gristle by which the bones are prolonged, and if, in some weak states of the system, it may be further a little puffy and dropsical, this is due to the state of the body, and is not likely to be improved by the ruthless mutilation of this useful and ornamental appendage. It is true that the tail may slough off from dry gangrene in cattle feeding on ergoted grasses, or from moist gangrene after inoculation for pleuro-pneumonia; it may drop off gangrenous in young pigs with a weak circulation, or it may suffer from mechanical injuries of various kinds; but these conditions are all patent enough to the external senses, and do not require a wayward imagination to recognize them.

The destructive *black tooth*, like *horn-ail*, is a disorder exclusively American, and its existence as a fatal disease rests on about equal authority. A pig is ill of indigestion, deranged biliary or urinary secretion, or other malady inappreciable by those about him, and forthwith, at the expense of much muscular effort and hog music, his mouth must be torn open by a couple of nooses placed on the respective jaws, and one or more blackened teeth being discovered, they are hammered off level with the jaw. The hog sometimes

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recovers, as he would probably have done had he been let alone, and as he would much more certainly and speedily, in the majority of cases, had he had a good soapy wash and three or four ounces of castor oil. But, seriously, if a tooth dyed by the imbibition of coloring agents, but otherwise sound, can be conceived of as injurious to the hog, how much more hurtful the broken and decaying stumps left as permanent irritants in the gums? If a tooth must be got quit of let it be extracted entire, otherwise much harm may result, but certainly no good.

But to leave these imaginary diseases, I shall glance at a few of the real ones that attack our farm stock, and offer some suggestions as to their prevention and treatment.

In the case of the horse, it is notorious how many of his diseases are connected with errors in diet. Colics, blind staggers, founder, excessive secretion of urine and heaves are especially deserving of mention in this connection. *Colics* arise mainly from over feeding, irregularities in feeding and watering, or from putting to work too soon after having swallowed a meal. Unsuitable food, such as that which is too watery, food that is still partially green, fermentescible and irritating, as in the case of newly harvested hay or grain, or food which tends to clog the digestive organs, like wheat and fine wheaten flour, are also common causes. A horse crouching, kicking at his belly, rolling and casting agonized glances at his flanks, in an attack of colic, may often be relieved by frequent injections of three or four quarts of warm water. This measure is especially applicable to the horse because of the extraordinary development of his large or terminal guts, in which obstructions and irritations are usually seated, and which may be, to a great extent, unloaded by the direct solvent action of the injection, as well as by the contraction of the anterior portion sympathetically with the more posterior and terminal part. To those who are in the habit of employing injections in diseases of the digestive organs in the horse, nothing need be said in their favor; but for those who are not, a statement of the capacity of the intestines and the nature of their contents, may not be superfluous. The large or terminal intestines of the horse, then, are capable of holding from twenty-eight to thirty gallons, or within a fraction of two-thirds of the entire intestinal contents in the animal. Add to this that the contents of the anterior or small bowels are invariably semi-fluid, while those of the large intestines become increasingly firm and dry, and we find a reason not only for the greater prevalence of disease in the latter, but

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also for the highly beneficial effects of copious injections. These remedial measures, moreover, may be applied by any person, and in all kinds of maladies, without risk of injury. The only precautions are to avoid using the water at an unpleasant heat, to oil the nozzle of the injecting instrument and to introduce it with a requisite degree of caution. The common barrel syringe, holding about a quart, is an excellent instrument for the purpose, though, perhaps, a still better may be made from block tin, in the shape of a funnel, eight inches high, communicating below with a tube joining it at right angles, projecting six inches and rounded at its fore end, after the manner of the nozzle of the syringe. This has the advantage that it draws off any gas which may have lodged in the last gut, while the barrel syringe is very liable to introduce air.

But colics are not always to be overcome by simple injections. In bad cases two or three ounces of sweet spirits of nitre and twenty drops of tincture of aconite may be given in a few ounces of water. If a repetition of this dose does not relieve the patient in the course of one and a half hours, a laxative, consisting of five drachms of aloes should be at once given, to rid the bowels of their irritating contents. The nauseating and anti-spasmodic action of this agent will often relieve suffering within half an hour, and nearly always within four hours after it has been given, though the dung is not seen to be materially affected until next day. But I would add a caution as to the form in which the aloes are given. If given in the form of liquid as a drink, a half and upward is usually lost, a fact which accounts for the absence of all effect after a quarter or half a pound of aloes are supposed to have been administered. The powdered aloes, mixed with a drachm of ginger, and, if it is at hand, two drachms of extract of hyoscyamus should be made up into a bolus, in the form of a cylinder, about two and a half inches long and not more than three-fourths of an inch in diameter, rolled in thin paper, and the tongue having been seized with the left hand and turned up between the jaws so as to compel gaping, the bolus held in the right is carried over the tongue and lodged just over its root, in the median line. The tongue is immediately released, and the bolus is inevitably swallowed.

Blind-staggers, so prevalent in some parts of the States, and, to some extent, in New York, results directly from partial or complete paralysis of the stomach, whether as the result of overloading or of some agent which directly impairs nervous function. The brain disease is a secondary or sympathetic affection, and hence, if we attack

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the primary seat of the malady, all such heroic measures as bleeding, blistering the head, &c., may be profitably dispensed with. An over-feed of grain is a common cause of this disease. Another is the feeding on grain, legumes and other fodders which have approached the period of ripening but have not been fully dried. Chief among these last agents are over-ripe rye grass, vetches, tares or millet, cut and fed green to the animals. Whole stables fall victims at once from this cause. Besides a complete change of diet, an appropriate treatment consists in large doses of aloes, a half more or double those given for colic, combined with four drachms of carbonate of ammonia, and frequent and copious injections. Food should be semi-liquid bran mashes until complete recovery is insured.

From sympathy of the integument with an overloaded stomach *founder* frequently results. It must be met in the same way, by a purgative to clear away the primary source of irritation, and if caught in the outset will often demand nothing further than soothing poultices applied to the feet, the shoes having been removed, a roomy, well-littered place where the patient can lie in comfort, and an ounce dose of nitre daily, for six days after the physic has ceased acting. A restricted diet of bran mashes and roots must be kept up during convalescence.

Profuse staling, insatiable thirst, and rapid emaciation are frequent results of feeding on heated or musty hay or oats. As in most other cases, to know the cause is virtually to check the disease, though in some instances it may be necessary to give a course of tonics to restore the prostrate vital powers.

Broken wind, or *heaves*, is perhaps the most universally diffused evil result of improper feeding. Our splendid crops of clover and timothy, cut at the period of ripening, invariably dusty, and too often imperfectly cured, cannot be fed as they usually are to our agricultural horses with impunity. These horses, confined to the stable for days and weeks in succession, are habitually gorged with this hay, which injuriously affects the stomach by its dry, musty properties, in addition to the torpidity of the organ superinduced by a constant over-repletion. The common nerve of the stomach and lungs is functionally deranged, by which, as well as by the mechanical pressure of the loaded abdominal organs, breathing is impaired, and over-distention and rupture of the air cells ensue. Conjoin with these a full feed of grain, and, without any breathing interval, a hard and lengthy trot by the unprepared animal, and it is a miracle if the ill-used beast escapes. Musty hay should be altogether withheld from horses. Dry

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clover or timothy should be given in small quantities only, not exceeding fifteen pounds daily; should be slightly damped, and in case of a horse showing the slightest premonitory symptoms of *heaves*, the allowance should be reduced to one-half, and the grain correspondingly increased.

These considerations further explain the good effects of a laxative diet in cases of heaves; how mild cases, turned out on the prairies, sometimes recover; how the same result occasionally attends a diet of corn stalks, roots, cooked food, and the like. The stomach, no longer loaded with a dry, debilitating aliment, by degrees regains its lost vigor, and in this restoration the lungs participate, provided the changes of structure are not too extensive to permit of a complete reparatory process. Certain agents having a special action on the nervous system will also assist in the process of recovery.

Respecting inflammatory diseases of the chest and elsewhere, I will add nothing new to the suggestions I have already offered for a rational treatment to be adopted in their initial or shivering stage, and which may be held to apply equally to all our larger domestic quadrupeds. Some remarks, however, on the varying types of disease, and on one or two common specific maladies, will not be altogether out of place. It cannot be denied that in the treatment of inflammatory complaints at the present time the severe bleedings, purgings and other depleting measures formerly in vogue cannot boast a respectable per centage of recoveries. Some of the most remarkable illustrations of this fact are to be met on the registers of medical hospitals. Thus, in the case of inflamed lungs, Dietl treated large numbers in the hospital at Vienna; first, by blood-letting; second, by large doses of tartar emetic; and third, by diet only. Under the bleeding and antimonial treatment, the deaths were in the ratio of one to five patients, while in those treated by diet alone they were at the rate of one to thirteen and a half. Bennet, of Edinburgh, under a judiciously supporting treatment, lost but one patient in twenty-two. Happily the lancet has been to a large extent discarded in human medicine, but it is still resorted to with destructive frequency in the treatment of sick animals. While I would not forbid its use in appropriate cases, I will point out one or two conditions in which it must be utterly discarded. In advanced stages of diseases generally; in those already attended by profuse discharges from the bowels or kidneys, or in which extensive liquid effusions have taken place into the limbs, or into internal cavities, thereby impairing vitality and fostering weakness and prostration; and in all diseases, inflammatory or

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otherwise, which are attended by a low type of fever. This is especially evident in epizootic diseases, which strike down many animals at once, as in *influenza*. If any such affection is associated with a weak, rapid pulse, with dull, sunken, watery eyes, with pale or deep bluish red color of the lining membrane of the nostril, with strong impulse of the heart against the left side, just behind the elbow, and if there is early and rapidly increasing weakness and prostration, avoid the lancet as you value the life of the patient, and support by fresh air, nutritious gruels and mashes, by stimulants, and even tonics. Many animals affected in this way might be saved by an exclusively dietetic treatment, which are now consigned to a premature grave.

The *strangles* or *distemper* of young horses is another example of the value of a supporting treatment. If treated by warm, sloppy mashes, frequent inhalations of vapor from bran soaked in boiling water, and large poultices applied to the swelling on the lower jaw, the termination will be almost invariably favorable; while if harsh, debilitating treatment is resorted to, the results are most disastrous.

Among the common maladies of cattle, those of the stomach hold a foremost rank. A consideration of the relative capacity and functions of the various parts of the digestive organs in the horse and ox sufficiently explains the divergence in the general types of their diseases. In the horse, the functions of the stomach are limited and completed soon after a meal is swallowed, while the subsequent progress of digestion and absorption is carried out in the capacious intestines. In the ox, on the other hand, the food is long retained in the enormous reservoirs of the stomach, until it has become thoroughly infiltrated and softened by contact with heat and moisture, until its starch has been changed into sugar by the action of the saliva, until it has become most intimately divided and subdivided by rumination and the grinding action of the manifolds, and after all this elaborate preparation it is still subjected to digestion in the fourth, or true stomach, before it can be allowed to pass into the intestines. The digestion remaining to be completed in the intestines is, as might be expected, relatively small as compared with intestinal digestion in the horse. The entire length of the ox's intestines, as compared with the same parts in the horse, is as five to three, but, owing to their smaller calibre, their capacity is to that of the horse's only, as five is to nine. Length: horse, ninety feet; ox, 160 feet. Capacity: horse, thirty-eight gallons; ox, twenty-two gallons. Turning to the stomachs, we find that whereas the horse's stomach will contain about sixteen quarts, the four gastric cavities of the good,

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average cow will hold close upon 200 quarts, and in many cases even more than this.

Considering the enormous amount of work done in these primary digestive cavities of the ox, it is no longer matter for wonder that he is so very subject to bloating, or tympany, or overloading of the paunch with solid food, to dry murrain or impaction and drying of the contents of the manifolds from feeding on smutty corn or stalks, from a dry fibrous aliment, or from one too exciting and irritating, and to a similar condition of the stomachs, with a corresponding implication of the brain when some form of lead has been swallowed. For all these disorders alike, strong stimulants and purgatives, with a free supply of water, will usually clear out the stomach, and bring about a happy result. In tympany or bloating, however, some agent should be given to rouse the torpid paunch into action, and to counteract fermentation in its contents. For this purpose, the preparations of ammonia are usually given, such as the common smelling salts (carbonate of ammonia), in doses of half an ounce dissolved in water, or liquor ammonia in doses of two teaspoonsful in a pint of water. If these are not at hand, six or eight ounces of whisky, gin or brandy may be given, or, better than all, an ounce of spirits of turpentine shaken up in oil or milk, or two ounces of tar rolled up in paper, and so administered. Two drachms of carbolic acid would have a similar effect. These three last named agents operate mainly by counteracting fermentation, and usually act like a charm and almost instantaneously. If the swelling is such as to place life in imminent danger, no time should be lost in getting medicines, but immediate relief should be given by plunging a pocket knife, in the absence of anything better, into the left side, at a point equally distant from the back bone, the point of the hip bone and the last rib. This should be done fearlessly and unhesitatingly, as the paunch lies here in direct contact with the side, and if the point of the agent with which the puncture is made is directed slightly downward, it may be pushed in more than a foot without the possibility of contact, except with the contents of the stomach.

I shall refer at present to but one other class of bovine maladies, the carbuncular fevers, mainly represented in our northern States by the maladies designated *black-leg*, *black-quarter*, and *black-tongue*. *Black-leg* is a malady ushered in suddenly by symptoms of very high fever; shivering, followed by great heat of the surface, rapid, difficult breathing, accelerated pulse, at first strong and full, but soon quick and weak; suffusion of the visible mucous membranes, such as

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those of the eye, nose, mouth, etc., of a very deep red, often tinged with yellow; great dullness and prostration, with hanging head and drooping ears; in the course of an hour or two halting upon one or more limbs, and very soon diffused pasty swellings on the shoulders, quarters, or on the body, from blood thrown out into the meshes of the tissues. Soon these swellings are felt to crackle, when handled, because of the decomposition of their constituent parts and the extrication of gases under the skin. The animals die in periods varying from six to thirty-six hours after the commencement of the attack, or, in rare cases, a slow recovery ensues. *Black-tongue* is introduced by the same general symptoms of fever, prostration, flushing of the mucous membrane, etc., but in place of the halting and swellings of the surface, the tongue is swollen, covered with blisters and later becomes of a deep red or even black hue. These diseases are essentially connected with an undrained soil, rich in organic matter; a soil saturated with liquid during the winter and spring, but drying up and exhaling its noxious organic products during the droughts of summer and autumn. For this reason they are much more prevalent in the malarious districts of the south than they are in our northern States, and assume many other forms beside the two I have mentioned, and, in hot, dry summers especially, devastating the herds most extensively. In all its forms, this disease is associated with fermentative changes in the blood, which, with the carcase of the animal, commences to putrefy two or three hours after death. In the dead body the blood is always black and tarry, varying according to the number of hours the animal has survived the onset of the attack, it solidifies into a loose clot or not at all; it stains the hands, paper and other objects more deeply than ordinary blood, by virtue of the broken up condition of the globules and the universal diffusion of the coloring matter, and it contains special organized germs (bacteria or vibriones), which find in this disintegrated blood a natural habitat. Other agencies contribute to the development of these diseases, such as sudden accessions of plethora in animals which have been starved at one period and over-fed at another, inferior quality of food, which deteriorates the health and lowers the power of vital resistance, drinking of stagnant water, etc., but the main cause is unquestionably an undrained soil rich in organic remains, and in a climate which dries and bakes this soil at certain periods of the year. I could point to many farms in the south of Scotland, and in England, where, before the adoption of a thorough land drainage, these maladies yearly recurred but from which they have disappeared with the inauguration of a

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more porous condition of the soil. Wald reports, concerning the district of Potsdam, which was formerly decimated by these maladies, that since the cultivation of the meadows and the feeding of the cattle in doors the losses has been greatly diminished. Buhl reports, from Donauworth, where these maladies were formerly rife, that they have completely disappeared since the advice of Pettenkofer was carried out in the drainage of the wet lands. I forbear to advance further instances of this kind, though their number might be indefinitely extended. By reason of the short duration of these affections and their extreme fatality, remedial treatment proves, too often, valueless. When time is allowed, the bowels should be opened by glauber salts, half to one pound, according to the size of the animal, and drachm doses of crystallized carbolic acid dissolved in a pint of water should be given at intervals of eight hours, until improvement is manifest. A lotion of the same kind should be applied to the local swellings at equal intervals, the blisters on the tongue being cut open, and the tumors of the skin scarified, whenever crackling indicates the presence of gas. Dashing of cold water over the surface is often useful when the fever heat is intense. Carbolic acid may be likewise used in the food or water as a preventive. A caution is demanded for those who may handle the bodies of such animals in life or in death. In very many cases a virulent poison is developed, capable of fatally communicating *malignant pustule* to man by inoculation. Hence, any one approaching these animals should use carbolic acid freely, and carefully cauterize any wound or abrasion of his skin.

Not to tax your patience unduly, I will only refer further to certain diseases of sheep, connected, as regards causation, with undrained soil. *Rot* appears to be increasing, rather than otherwise, in our flocks. This disease, as many of you are aware, is a malady of low-lying, wet lands, with rank, aqueous pasture, and stagnant water. It consists, essentially, in a debilitated state of the system, a thin, watery condition of the blood, and the development, in the bile ducts, of an almost unlimited number of the flat, leaf-like worms known as *flukes* or *distomata*. In its earlier stages, this disease is recognizable mainly by the soft, flabby state of the muscular system, and the pallor and yellow or jaundiced appearance of the eye and other mucous membranes. Later it is manifested by increasing emaciation, and dropsical effusions in the more dependent parts of the body, and especially beneath the jaws. The same malady exists, though somewhat less frequently, in cows. The *fluke worms* by which the liver is infested and has its functions disturbed, is a parasite which has to undergo a

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series of successive metamorphoses before it can attain its highest stage of development in the liver of the mammal; and in certain of its developmental forms, the imperfect animal can only live in stagnant water. Thus the egg or germ of the fluke will remain undeveloped, unless deposited in water. If in this element, however, it soon pushes off the lid from the egg, and passing out, swims about actively by the aid of microscopic vibrating cilia. This active sporocyst generates a large number of living germs or *cercaria* in its interior, and entering the body of some aquatic animal, brings forth these more advanced forms of its kind. These are flattened, leaf-like bodies, not unlike the perfect distomata, but it is not yet permitted them to develope into these. They leave the bodies of the animals in which they have been brought forth, swim about freely in the water, and penetrating into worms, slugs and larva of insects, they lose their tail and become inclosed in a cyst. These worms, slugs and larva are inadvertently swallowed by mammals, mixed with their food or water, and then comes the final step by which the distoma attains its full development. The snail or other host is digested in the stomach of the mammal, and the incysted distoma, being set free, makes its way into the biliary ducts of its new host, accumulating, in many cases, in numbers almost beyond computation. It will be thus seen that an essential condition of the existence and successive metamorphoses of the fluke worm out of the mammalian body, is the presence of standing pools of water. Destroy these, and various links in the chain of its existence are necessarily broken, and it perishes either as an egg, in the body of the aquatic animal, or as a cercaria. As the introduction of these flukes into the bodies of sheep is an essential condition of the development of *rot*, fostered, it is true, by the ingestion of the watery and innutritious grasses growing on marshy lands, it follows that the thorough drainage of such lands, and the removal of the stagnant pools, must put an end to the disorder. And this is precisely what we find in practice. Wherever drainage can be made thorough over the entire range allowed the flock, there this disease ceases to exist. And in keeping with this is the fact that when sheep in the earlier stages of the malady are removed from the unwholesome pastures to perfectly dry land, and allowed grain and tonic agents, especially iron and common salt, they usually recover from the malady.

The development of all other internal worms is fostered by that low condition and weakness of constitution which is the inevitable result of a damp, relaxing atmosphere, an undrained soil, and aqueous,

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innutritious fodder. This is true alike of the *bladder worms* in the brain and liver, or the *round* and *tape worms* of the lungs and digestive organs. There is every reason to suppose, indeed, that in the case of certain round worms, their habitat, out of the body, is in pools of stagnant water. As in the case of the fluke worm, then, not only is their production favored by the weakness that results from the inevitable rank and aqueous grasses which grow on such land, but its pools become a *sine qua non* of the preservation of the parasites.

I might mention other maladies, such as the dropsies, or *yellow-water*, so prevalent on land of this kind, but I will select rather the *foot-rot* of sheep and cattle, as a further illustration of the noxious influences of land habitually wet and soft. Many, I know, attribute the propagation of this disease to contagion alone, but the elucidation of its alleged contagious or non-contagious properties does not belong to my present purpose. I mean, rather, to give prominence to the notorious fact that there are certain lands on which sheep cannot be turned for any length of time, uncared for, without their contracting *foot-rot*. And such lands present very similar characters to those on which the *liver-rot* or *fluke-distemper* abounds. They are low, soft and marshy, and deficient in stony or hard ridges or knolls. The feet of the sheep, habitually soaked in moisture, lose their flinty hardness and power of resistance, becoming soft, wanting in cohesion, and easily torn. If such horn is dried, it becomes much more brittle than the more natural horn, and being overgrown by reason of the soaking and the absence of wear, it is readily torn or cracked to the quick, or the over-lapping edges, pressing inward upon the sole, bruise it and set up inflammation and ulceration. In other cases, clay and other filth, lodging between the claws in a wet, soft condition, hardens and determines ulceration at the upper end of the cleft. However caused, whether by one of these conditions or by undue wear of the hoofs during a long journey upon hard soil, ulceration once started beneath or in the immediate vicinity of the horn, is quite equal to its own maintenance, and if nothing is done to check it, it will progress, preceded by inflammation, suppuration and detachment of the horn, until one or both hoofs on the affected foot are shed. What is wanted is to pare away all superabundant horn, remove all that is underrun by matter and pressing injuriously on the quick, to thin the edges to make them pliant, afterward dressing with a feather or brush dipped in a solution made with one part of oil of vitriol and three of water, or still better, one part of crystallized carbolic acid to three of glycerine, and preserving the foot from mud, in bad cases, by bandag-

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ing it with tar. Simple paring of the foot, at intervals, will usually ward off the disease on land to which it may be said to be native. Laying the sheep walks in the pasture with fine gravel has sometimes been found equally successful. Lastly, many farms in Great Britain could be mentioned, from which *foot-rot* has been virtually banished by a thorough drainage and a consequent increased dryness and firmness of the soil.

As I began by speaking of charms for the prevention of diseases, I will conclude by a *resumé* of a few of the unquestionable virtues of the modern talisman *drainage* as a preventive of the diseases of farm stock. Government reports state that *staggers*, one of the most destructive horse diseases of this continent, abounds everywhere in malarious regions; but so does the inferior hay and provender generally, which is, to a great extent, musty and covered with cryptogams. And, when in otherwise healthy localities, the fodder, in connection with a wet season, partakes of these properties, so does this disease spread like an epizootic. Drain off the superfluous water from the soil, render it sufficiently porous, and enable it to give up its unlimited organic constituents to nourish its growing crops, and with judicious feeding of the stock this malady will, to a great extent, disappear. *Periodic ophthalmia* or *moon blindness*, though largely dependent on a hereditary taint, has its attacks traceable, in the great majority of cases, to that coarseness and laxity of fibre and phlegmatic constitution, which are determined by low, wet and undrained lands and a moist atmosphere. Climate and locality have so great an influence on the disease that on the wet lands, to the north of the Pyrenees, nearly all horses are attacked by it; but the Spaniards, dwelling on the south of this mountain chain, do not hesitate to buy up the young horses which have only had one attack of the malady, since experience has taught them that if these animals are removed to the high grounds of Catalonia, they rarely suffer from another attack. The *dropsies* or *yellow-water* of all our domestic animals are also, to a large extent, determined by the constitutional relaxation due to such soil and climate. In England they prevail, especially on those portions of Yorkshire, Lincolnshire and adjacent counties which barely rise above the sea level, and where drainage is, consequently, very partial and imperfect. My experience in the United States would warrant me in saying that it is a common malady here on undrained lands, and its increased prevalence, during the past year, may be attributed to the aggravation of this, caused by the wet and cloudy summer.

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To these, as we have already seen, may be added the *colics*, *profuse staling* and *heaves* of horses; the *black-leg*, *blood disease* (*maladie du sang*) and other carbuncular diseases of cattle and sheep; the *rot* and *foot-rot* of these same animals, and most of the *worms* of all farm stock. We have thus placed before us a long list of diseases more or less directly dependent on undrained soil for their development, and which owe their extensive prevalence, in many localities in America, mainly to this cause. I will not venture even an approximate estimate of the enormous losses from these diseases over the entire continent, but, judging from the reports of the Commissioner of Agriculture, they make up a very large proportion of the entire losses sustained in live stock. And if the statement of the Hon. Horace Capron, in his last report to Congress, is correct, that "a judicious investment in drainage often pays 100 per cent the first year," the considerations I have offered regarding its effect on the health of stock will, I trust, add materially to the strength of his argument, and lead to a more universal adoption of this desirable improvement.

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REPORT

OF WILLIAM H. CARMALT, M. D., COMMISSIONER FOR THE INVESTIGATION OF ABORTION IN COWS.

Mr. President and Gentlemen of the Society:

On June 2, 1869, the commissioner had the honor to address a letter to your Secretary, containing a proposition to continue the investigation of the subject of abortions among cows for another year, as follows:

NEW YORK, 69 WEST 45TH STREET,
June 2d, 1869.

Mr. T. L. HARISON:

DEAR SIR.—As you are aware, the investigation into the subject of abortions among cows was not considered closed at the time of handing in my report, in February last; and, although certain views were therein expressed as probably exerting a strongly unfavorable influence against the healthful performance of the process of gestation, it was still held that the information in the possession of the commissioner did not warrant an expression that these views had been established, however probable they might appear.

In order that, if possible, a more decided expression may be allowed and those views confirmed, if correct, as also that measures calculated to arrest the disease may be advised; or, what is, perhaps, more important, in order that no false impressions may be promulgated in a semi-official form, even in the guarded manner there given, if further inquiry should throw doubt upon their probability, I would respectfully suggest, through you, to the Agricultural Society, that the investigation be continued during the coming season, in certain dairy and cattle-raising districts in the western States (where inquiries, in 1867, showed that the disease had not appeared), to a sufficient extent to determine whether the same practices in breeding and milking, during pregnancy, prevail there to the degree found to exist in Herkimer county, where the disease is so extensive.

I make this suggestion with more freedom, as the whole amount of the appropriation made by the Legislature last year was not exhausted by the commission, but a sufficient sum was then left unexpended to allow the investigation, here referred to, to be made; and I beg leave to state, in addition, that I shall make no charge for my own services, but that all the available funds will be applied to gathering information, or used in the necessary expenses incident to

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the getting out of the report, so that as large a number of reports (of farms) shall be obtained as is possible.

Very respectfully yours,

W. H. CARMALT.

In reply, the following letter was received, June 25, 1869:

ALBANY, *June 24th*, 1869.

W. H. CARMALT, M. D., *Commissioner, &c.*

DEAR SIR.—I have to inform you, that at a meeting of the Executive Committee of the New York State Agricultural Society, held this day, upon reading your letter of the 2d instant, it was

Ordered, That the commissioner in charge of the abortion investigation, have authority to expend such a sum, not exceeding $500 (five hundred dollars), as he may see fit, in the supplementary investigations proposed by him in his communication, dated the second of June instant.

Yours respectfully,

T. L. HARISON,

Secretary.

In order to carry out the especial object above given, and to make the comparisons instituted perfectly fair, two points were necessary. 1st. That the dairy products of the districts compared, should be the same; and if prepared by the same methods, the comparison would be still more accurate. 2d. That the treatment of the cows, in all points relating to their care or breeding, should be thoroughly inquired into, and, whatever differences found, be fully considered.

The selection of a locality which would hold a fair comparison with the investigation last year, was the subject of much care, and after as thorough an examination, from the means at the disposal of the commission, as possible, Geauga county, Ohio, was chosen as bearing the closest comparison, in the matter of dairy products, with Herkimer county, New York. For, in the investigation of 1867, under Dr. Dalton's direction, the farmers' reports from the States of Ohio, Michigan, Illinois and Iowa, indicated that the so-called Western Reserve district in Ohio, was the most important dairy district in the west; and from an examination of the reports received from twenty-three (23) counties in that State, together with the Report of the Ohio State Board of Agriculture for the same year, it was found that of about 20,000,000 of pounds of cheese made in that State, 5,000,000, or twenty-five per cent, was made in Geauga county; and further, that more than one-third of all the cheese factories in the State were in that county, fifty-two being reported in the State, of which nineteen were in that county. This made the comparison

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tolerably close, for the census report of the State of New York for 1865 (two years before), indicated that Herkimer county was the largest cheese producing county therein, manufacturing about nineteen per cent of all made in New York; and we thus have, in each, the largest cheese producing county in their respective States, each also preparing its cheese, to a very great extent, by the means of cheese factories.

With regard to the second point above mentioned, the reports and letters received in 1867, by the commission, from about one hundred (100) farmers in the (23) twenty-three previously mentioned counties, situated in all parts of the State of Ohio, showed no evident difference to account for the absence of the disease there as compared with New York, so far as was included in the points inquired into that year. In order, therefore, to determine if the points in the investigation of 1868 contained the elements by which to account for the disease, a blank form of report, containing the same series of questions, similar in all respects to those used in 1868 (except as to dates), was furnished to inspectors; who were instructed to pursue the investigation by personal inquiry and examination on the different farms, as had been practiced for the two previous years.

It is unnecessary to enter into the details of their instructions; they differ in no respect from those contained in the report of 1868, except in one particular, *i. e.*, that, as in 1868, the instructions were to inspect every farm; in 1869, the following directions were substituted: "As the object of the inspection this year is to make an accurate comparison between the dairy farms, and the manner in which the dairy business is conducted, so far as relates to the care and treatment of the cows, you will please inspect those farms only on which butter and cheese (or milk) are made an article of sale; those farms on which cows are kept for the purpose of raising stock only, not being considered to afford a proper comparison with the dairy farms of Herkimer county." In addition to the points embraced in the blank form, they were instructed to report, "How long has this farm been used for dairy purposes?" "Has the disease of abortion ever prevailed thereon?" "If so, when, how long did it continue, and when did it stop?"

The commission was so fortunate as to secure the services, as assistant inspector, for a part of the time, of Dr. Benjamin R. Swan, who had been in the service of the Society, and inspected the towns of Newport and Fairfield last year. The experience then obtained, of the manner in which the cows of Herkimer county were cared for,

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made his observations all the more valuable here, and he was furnished with a copy of the form of report used in 1867, in which the points more directly referable to their care are contained, and was instructed to note any differences therein, as between the two districts, thus establishing the accuracy, or otherwise, of the reports received in 1867 from the farmers themselves, as also going over the whole ground with more care than any general directions would have been likely to have secured. Dr. Swan began his term of service on August 13th, and finished on September 7th. He was succeeded by Mr. George A. Vanwagenen, who entered on duty September 20th, and finished on October 16th.

Reports were received from these inspectors, as follows, viz.:

	Farms.	Cows carrying calf to full term.	Abortions.
From the town of Chester	50	775	1
From the town of Chardon	44	649	.....
From the town of Munson	63	1,042	.....
From the town of Claridon	65	737	1
Total	222	3,203	2

Of the abortions, one occurred in the sixth month of pregnancy, the other in the ninth; one took place in December, the other in March; one was sired by a yearling bull, the other by a two years old; both occurred in cows which had borne a calf at full term the previous year; both cows had been on the respective farms upon which they then were for more than one year; no history of injury was obtained in either case. The proportion of abortions to the whole number of full term calves is too small, however, to consider these cases as otherwise than independent of influences at present affecting the cows generally, nor will they be again considered in this report, the district being assumed to be free from the disease.

The investigation in Ohio being simply a continuation of that of last year, the points in the report then made will be taken up *seriatim*, and the two compared.

1*st. As to the ages of the bulls used.*

	In Herkimer county.	In Geauga county.
Cows served by yearling bulls	32 per cent.	49 per cent.
Cows served by two years old bulls	65 per cent.	45 per cent.
Cows served by "aged" bulls	3 per cent.	6 per cent.

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Showing, so far as the prevalence of abortions in Herkimer county is concerned, there can be no immediate influence against the use of yearling bulls, but arguing, so far as it goes, to an advantage in their favor.

Your commissioner desires to be understood in this question; he does not, in either report, assert or intend to imply, that the age of the bull is likely to influence, in one way or the other, the probability of a cow once impregnated, carrying her calf to term; the fœtus conceived by a young bull would be just as likely to live as that conceived by an older one; the ovum once having been impregnated, by healthy material, is under care of the dam, to whom we must thereafter look for any stoppage in the natural process of gestation. The influence of the age of the bull must be looked for farther on; farther than it is practicable for this commission to carry it, *i. e.*, to the point of determining whether the cow, whose *sire* was an immature bull, carries her calves to term or habitually aborts; but this is beyond any tangible information.

2d. As to excessive service of the bulls.

AVERAGE NUMBER OF COWS	In Herkimer. county.	In Geauga county.
Served by yearling bulls.....	20	23
Served by two years old bulls.....	32	20
Served by "aged" bulls.....	41	29

There is, therefore, no indication in this table that any unusual drain is inflicted on the bulls in the affected districts, to cause this disease, confirming the observations of both previous years.

3d. As to the pregnancy.

No marked difference has, in either of the former investigations, been shown as to liability to abortions between first and subsequent pregnancies; and it is worthy of remark here, to find that about the same per centage of the herds in each district are heifers; in Herkimer county, nine per cent; in Geauga county, eight per cent.

4th. With regard to removals from farm to farm.

By the investigation in Herkimer county it was found that there the per centage of abortions among cows "raised on the farm" was less than among those "brought on at any time during or since their first pregnancy," in the proportion of .046 to .07, and it was therefore inferred that, in a country where no abortions prevailed the proportion of cows "raised on the farm" would be greater, but the

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investigation this year does not justify this inference. In Herkimer county thirty-seven per cent of the cows are "raised on the farm" reporting them. In Geauga county but thirty per cent are thus raised, and the conclusion drawn from the inspection of Herkimer county is not sustained by the statistics obtained in Geauga county though justice to the farmers of Geauga county, who have, through Dr. Swan, entered their protest against the practice of frequent changes in their herds, requires that his remarks on this subject should be given. On August 19th, soon after commencing his inspection, he says: "The farmers are strongly prejudiced against cows from the west, preferring those that have been raised about here, and they seem to think that it is best to raise their own stock, and most of them raise two or three every year." On the 21st he states: "I find the herds more permanent here than in Newport. The same cows remain on a farm till too old to be profitable, while in Newport it was rare to have the same herd in December that was on the place in January."

After having finished the inspection, his final report states: "Almost all have tried the plan of 'deaconing' all the calves and buying cows to replenish the dairy, but it has been given up. All (? Com.) say it's much better to raise their own cows; that cows brought in from the west and south never do well the first year, and they find they can raise a calf about as cheaply as they can buy a cow, and then they know what they've got. I am told that four or five years ago it was almost universal to buy cows, and not raise calves; but it was decided that it was a ruinous process, and it's been stopped, and I do not remember one who has not from one to a dozen calves growing up, the plan being to raise the best calves, and sell the poorest cow as the dairy increases in numbers. In this way the herd is growing better, and it is these refuse cows that drovers take to New York." It is further respectfully submitted that the apparent discrepancy between the inspectors' reports and the farmers' statements is accounted for in the letter last quoted, where it says, "four or five years ago it was almost universal to buy cows, and not raise calves." May not the inspectors' reports be, to a large per cent, made from the cows thus bought?

A further investigation of this point, relates to the condition of pregnancy, or otherwise, at the time of removal. From the facts presented from Herkimer county, it appears that cows subjected to removal from one farm to another, during pregnancy, are more liable to abort than those removed non-pregnant, and who subsequently

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became so. No cows were reported non-pregnant at the time of their removal, in the four towns inspected in Geauga county, but the proportion of *yearly* removals is less, being but twelve per cent, while Herkimer county reports seventeen per cent of yearly removals. An isolated fact bearing on this point may be mentioned. Dr. Swan writes: "I met to-day, at Mr. Lester Taylor's, in Claridon, a Mr. Wilder, a dairy farmer from California. He keeps about three hundred (300) cows, two hundred (200) milking, the others coming on; he makes butter entirely. * * Last year he drove his cows down from one ranch on the mountain slope and through the valley to another ranch, and the *next day* a number aborted. Whether it was the journey, which was only seven or eight miles, and not unusual, or the change of feed, or strains, he could not tell."

5th. Period at which the cows first began breeding.

The instructions to the inspectors were the same as last year and the importance of getting accurate replies was insisted upon; all doubtful cases were rejected, and they report as follows, viz.:

Of eight hundred and seventy-nine (879) cows in Geauga county, which were raised on the farms reporting them (or were brought on as unimpregnated heifers), five hundred and fifty-five (555) or sixty-two per cent, first calved at under three years of age, while in Herkimer county, last year, eighty-three per cent were comprised in the same class. In other words, the farmers of Herkimer county, where abortions prevail at the rate of six per cent of all births, subject twenty-one per cent more of their heifers to the process of gestation, at an earlier period, than is the habit with the farmers of Geauga county, where abortions do not prevail. The injurious tendency, in subjecting the heifers to this process, before arriving nearly at maturity, was insisted upon last year, and subsequent investigation has but served to confirm the views then expressed; and, although the reports from Geauga county do not show that the farmers there are free from the charge of too early breeding, yet the practice is not carried to the extreme degree that it is in Herkimer county.

Among those who make a study of physiology, in either its scientific or its practical aspects, there is but one opinion as opposed to subjecting an animal to a process, making such great demands upon its nutritive powers, before arriving at nearly its full growth; and it is a well known rule, that the too early or the excessive exercise of any function impairs, either permanently or temporarily, its complete development. And the following conclusions, bearing directly upon this point, are drawn from the statistics of 16,953 cases in the female

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population of Scotland. 1st. That the comparative fertility of the female population increases gradually from the commencement of the child-bearing period of life until about the age of thirty years is reached, and then it still more gradually declines. 2d. The initial fecundity of woman gradually waxes to a climax, and then gradually wanes. 3d. The climax of initial fecundity is probably about the age of twenty-five years.*

In the case under investigation, it is requisite that all parts of the organization of a breeding heifer should have their growth sufficiently advanced to enable them to bear the demand upon their nutrition and future development, which gestation entails; the influence of the latter being toward checking the growth of all the rest of the organization, to the hindrance, more or less remotely in the course of generations, of the development of the productive process, and it can therefore only be necessary to show that a heifer has not arrived at her proper breeding period, at from one year to fifteen months of age, in order to prove that the disease complained of is a direct consequence of this practice. Yet this is the time at which, as has been shown in 1867, and again in 1868, eighty-three per cent of the heifers of Herkimer county are first covered by the bull, and the reproductive process initiated.

The fact of the presence of that portion of the reproductive process, comprised in the phenomenon of heat, or rut, is not sufficient authority for a breeder to immediately subject a young heifer to the labor of carrying on the remainder. Habits of domestication tend powerfully to stimulate this function to an early development and more active exercise; but rules must not be assumed from exceptional cases, and, although in the investigation of this subject, as well as in his personal experience as a farmer, your commissioner may have met with cases of extreme precocity, more extended observations do not justify that these should be considered otherwise than abnormal. One case is recorded, where a heifer gave birth to a fully developed calf, when she (the dam) was but fifteen months and twelve days old; she must, therefore, have been impregnated at the age of six months, the sire being a calf at the time of covering, of four months. Surely no one will assume from this case, that it would be good or even allowable management to set all calves to breeding as soon as they will allow intercourse; yet this is the argument which the farmers, where abortions prevail so extensively, use, asserting that the artificial stimulation which habits of domestication invariably excite, is the natural appetite.

*Dr. J. M. Duncan; Fecundity, Fertility, Sterility, etc. Edinburgh. A. & C. Black, 1866.

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In a table relating to the process of reproduction in mammalia, including about (50) fifty species, Prof. Dunglison gives,* under the head of "Age capable of engendering young," that of a cow, at (2) two years. As the same table gives the human female to be capable of engendering young at (14) fourteen years, it is evident that the compiler intended to make this the *minimum* age, at which the heifer could *naturally* conceive, for no one will claim that (14) fourteen years is a proper child-bearing period in woman. Cuvier states,† "The cow is gravid nine months, and can breed at eighteen" (months).

Additional evidence would not be wanting on this point, among strictly scientific authorities, but it is unnecessary. Theoretically, the practice is opposed to recognized physiological laws; but to show that these laws are not in opposition to practical experience, a few extracts, among a large number to the same effect, from the writings of those engaged in active agricultural pursuits, may be of interest, as showing the plan which they have found to be the most advantageous.

Journal of the Royal Agricultural Society of England Vol. IX, page 428. Keary on the Management of Cattle in Cheshire, a celebrated cheese district: "The age at which the heifers are first bulled varies in different herds, some breeders putting them to the bull at eighteen months old, while others prefer allowing them to run until they *complete* their second year."

Op. Cit., Vol. XIX, page 508. Wright on Management of Breeding Cattle: "Heifers are usually put to bull at two years old; sometimes, but very rarely, before; and this arrangement is found most conducive to the fruitfulness of the animals."

Op. Cit., Vol. XXII, page 137. Bowick's Prize Essay on the Rearing of Calves: "If a cow brings her first calf when from two to three years old, which the majority probably do, though all will admit that it is too early, we should not care to milk her more than five or six months after calving." In how many instances is this latter precaution observed in these districts where abortions are so frequent? Let the report of last year answer, page 33. And it was then further reported to this commission, many times, that the habit among the farmers was to force the heifers to as long a lactation as possible, on the ground that if this process was prolonged to the extreme that her future periods of lactation would also increase; a proposition that no physiologist will admit, and which nearly every farmer, who is capable, or rather who is in the habit, of putting the observations of two successive years together, will deny.

* Dunglison's Medical Dictionary. Philadelphia, 1857, page 795.
† Animal Kingdom. London, 1827. Vol. iv, page. 29.

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In the same journal, second series, Vol. II, part 1, *page* 45. Prize Essay on Management of Cattle, by Mr. Little, who is reporting the method adopted on one of the large estates in the north of England: "About fifty or sixty West Highland heifers, a year and a half old, are annually bought at the Falkirk Tryst, or Fair, in Scotland. They are brought home, * * * where they are wintered. * * * * In May they are turned out to pasture, * * * and the short horn bull is put amongst them in the beginning of July." This brings them to at least two years old before impregnation.

Op. Cit., Vol. V, page 280. Evershed on the Agriculture of Staffordshire, describing the manner of rearing young heifers: "The third winter, *being then in calf*, they are fed," etc., etc. These extracts show the course pursued by English breeders.

In France, Boussingault, whose position as a judicious rural economist is foremost, says:* "The age at which it is advisable to put heifers to bull depends a good deal on the way in which they have been kept and brought up, and also on their growth. Young animals of a good kind that have been well fed from their birth, and received all the care which contributes so powerfully to their development, will be ready to receive the bull when they are between a year and a half and two years old. * * * The rule, however, is not to allow the young female to be leapt until she is nearly at her full growth."

It is, therefore, evident that from a year and a half to two years is the minimum age at which it is practically economical, in its true sense, to allow a heifer to begin the process of gestation. The observations of the physiologist, and the experience of the practical breeder, who breeds for the best results to his herd, arriving, as they always will, to the same conclusion.

6th. The amount of milk obtained per cow.

This question, as affecting the immediate result, is second in importance to none other presented; and, as will be remembered, considerable emphasis was laid upon it last year, and the results obtained by the investigation this year are sufficiently confirmatory to fully warrant the views then taken.

AVERAGE YIELD OF MILK PER COW.	Pounds.
In Geauga county, of 2,979 cows in 1868 was	2,858
In Herkimer county, of 11,908 cows on non-affected farms, in 1867 was	4,386
In the State of New York, of 1,195,481 cows by the census of 1865 was	2,571

* Rural Economy. 2d ed. London, 1845. Page 586.

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By this it is seen that in Herkimer county the average yield is thirty-five per cent greater than in Geauga county, and that the average yield of the latter is ten per cent more than the average quantity obtained in the whole State of New York.

As between the counties of Herkimer and Geauga, this comparison must be taken as nearly accurate. The inspection was made in the same manner in both counties, in part in each by the same person, and, as was stated last year, inspectors were directed to make reference to the books of cheese factories whenever desirable. It may also be here mentioned that both gentlemen expressed themselves under obligations to the proprietors of factories for the facilities afforded them in taking notes from their books. In the case of the State of New York, there are, of course, many districts in which the dairy is of a very subordinate consideration, and in which but little care is taken to collect the dairy products.

Very great differences exist between individual cows, as well as between breeds, with regard to the amount of milk which they will yield; and if it could be shown that the cows of Herkimer county were a very superior race, better fed and better cared for than those in Geauga county, it might, with some propriety, be assumed that the above difference in the yield of milk is due to a natural difference between the local breeds. That, however, will not hold as between the cows of Herkimer county and those of the remainder of the State of New York (it is unnecessary to cite authorities on this point, it is a matter of too common observation); and, as between Geauga county, and Herkimer county, Dr. Swan's evidence is clear, and directly opposed to the assumption of the superiority of the Herkimer county cows over those of Geauga county. This gentleman, as has already been stated, was a careful inspector of the towns of Newport and Fairfield, in Herkimer county, in 1868, and was, therefore, able to make a fair comparison between the districts, and his instructions (before given) included observations on this point. He began inspecting August 18th, and writes: "I like the looks of the cows much better than in Newport." On the 21st: "I saw several herds yesterday, and was surprised at the excellence of the stock. The cows are large; the bulls at one and a half to two years, are larger than two of the Newport bulls." On the 25th: "The more I see of the cows the more I am convinced of their superiority, as a race, over the Newport cows." A man said, to-day: "They ought to have good cows in New York, for they come here to buy." Another spoke up and said: "Yes, but we only sell our poorest." On September 3d,

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in reference to the manner in which the dairies are kept up, after describing which, he adds: "And it is these refuse cows that drovers take to New York, as you can't buy a man's best cow here." And an examination of the returns in the reports of 1867, from all the States above mentioned, shows no difference or peculiarity in the breed of cows. They are reported, in a large majority, as "natives," the remainder being "grades," in no marked difference of proportion between "Short Horns," "Alderneys" and "Ayrshires." As the evidence obtained by the commission, is opposed to the view that the cows of Herkimer county are of a superior quality, the question which would most naturally arise next, is, whether the Herkimer county cows are better fed. Reports were made on this point from every farm inspected, in the three years during which this investigation has been progressing, and the result of a careful examination thereof is against this view.

In the report of last year it was shown (page 33) that the farmers of Herkimer county were in the habit of milking their cows to as late a period, during pregnancy, as possible, and that this was the means by which the increased amount was obtained. The deleterious influence of this practice upon the progress of gestation was also considered there, in some detail, to which it is only necessary to refer now. But do not farmers, in districts where abortions are unknown, pursue the same plan? It has been found impracticable to obtain absolute statistics on this point. The exact date at which conception took place is oftentimes unknown, and no record as to the time at which milking ceased, is taken; but allowing farmers to state their views, those of Geauga county are found widely different from those in Herkimer county given last year. Dr. Swan states, August 19th: "They (the farmers) all speak of the necessity of letting the cows rest, and think they get more out of a cow, in the long run, by letting her run dry three months than to milk close." August 25th: "The cheese factories here are not owned by the farmers in joint stock, as in Newport, but by an individual who buys the milk out and out from the farmers, so much per gallon. A farmer told me that Mr. Randall, one of the factory men here, was urging farmers to sow corn for fodder, and feed it, and milk through the winter, saying they did it in New York State. The farmer said he thought a cow wanted rest, and it would be better for the farmers to dry off for three months at least; he thought they would be richer at the end of ten years, than if they milked eleven months." In his final report, summing up the observations of his inspection, he says: "This country is *the*

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cheese district of the western reserve. The country is rolling, in some places very hilly, much more forest than in Herkimer county, New York. The soil has a large amount of clay. It is well watered, though not so well as Herkimer county; there being much more bottom land and more sluggish streams, the clay lessens in amount, and the country is better watered as we go further south. The almost universal custom is to let the cows run dry at least three months; all affirming that the cow needs rest, and that she comes out in the spring much better for it."

It is, therefore, evident, from the facts actually presented, as well as from the observations of the inspectors, as thus shown in comparing these two extensive cheese producing counties; in one where abortions do not prevail and in the other where they do, that the views expressed in the report of last year are in their most essential points sustained; one element, however, *i. e.*, that of frequent removals, considered in Herkimer county to be a somewhat frequent exciting cause of the disease, has been found to exist, to a greater degree, in Geauga county; but this is a minor point, and must be considered as one of the class of simply exciting causes, as distinguished from the predisposing or constitutional cause.

The immediate exciting cause of an abortion may be one of many, all more or less accidental in their nature, but it became evident, as this investigation proceeded, that a disease, affecting so extensive a region of country, arising, as this did, only after the dairy business had come, in the course of years, to be the principal interest of the district, and which gradually extended itself as that interest increased, that some general predisposing or constitutional influence or influences was at the bottom, and that the various causes assigned on all sides were but indications of a *tendency* to the disease, which must not be confounded with the main element.

In the first year of the investigation the attention of the commission was mainly directed to influences affecting individual cows, but nothing positively pointing to a cause was arrived at, although immense progress was made in clearing away a mass of conflicting theories or opinions, which had previously presented themselves as important influences; against every one of which, however, more negative facts could be brought to bear than could be presented in its support. Still, even at this early stage of the investigation, indications of the practice of breeding prematurely were seen, but they could not then be classified in a manner to be made useful.

In the following year the attempt was made to discover influences

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affecting farms, rather than cows; but still no positive reason could be found to account for the comparative immunity of one farm over another in the affected districts. The more definite form in which the inquiry, with regard to the age at which the heifers were bred from, was put, developed, however, the important fact of its very general early practice; and the increased average yield of milk, over that obtained from the cows throughout the State, who were of precisely the same breeds and cared for in the same way in other respects, indicated an additional injurious influence upon the reproductive process, which would directly react upon an animal already subjected to the labor of premature gestation found in both years to be exacted. It was then determined that whatever tendencies were at work to give rise to the disease were those of a predisposing nature, affecting the whole practice of dairying as carried on in the various districts inspected, and that in order to arrive at a satisfactory conclusion, the investigation must be carried to a comparison of districts.

The result of this last comparison is now before you, and the explanation of the manner in which those influences act, having been presented last year, it is unnecessary to enter upon them in more detail. And if, in the reports from time to time presented to your notice, but little reference has been made to many causes, which have been advanced by authorities having every right to consideration, it has not been because they did not have value in the mind of your commissioner, but because, after investigation, they were found to hold the secondary position, of being simply exciting or accidental in their action as affecting individual cows, and not predisposing causes, influencing whole districts.

The expenses of the commission have been as follows, viz.:

Salaries of inspectors	$136 33
Current expenses of inspectors	231 11
Printing	16 00
Postage, stationery, etc. (estimated)	10 00
Traveling expenses of commissioner	19 06
Total	$398 50

The assistant inspectors, Dr. Benj. R. Swan and Mr. George A. Vanwagenen, were both very careful and interested in their duties, and it gives the commissioner great pleasure to acknowledge the value of their services.

Respectfully submitted,

W. H. CARMALT, M. D.,

Commissioner, &c.

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APPENDIX.

The following table of the per centages of abortions on the farms in the town of Danube, for three successive years, is appended to show, first, the uncertainty of reappearance, and variability in amount of the disease on the same farm, in different years; and also (by further reference to the report for the year 1868) the relation between the quantity of ergot (*claviceps purpurea*—Tuls.) and abortions.

It is stated on page 8, of the report for 1868, that the list of per centages of abortions attached to table "E," is the record for the year ending April 1, 1868, but that the record for the following year must be procured in order to determine what influence the ergot reported had upon the abortions. This record has been obtained, and the results are found in the accompanying table, under the head of "Per centages of Abortions for the year ending April 1, 1869."

By comparing this with table E, page 66, report for 1868, the true relation between the ergot and the abortions, in this town, is found. Your commissioner has been unable, after a careful examination thereof, to establish any constant relation between the amount of ergot and the frequency of abortions, but the latter occurs irrespective of the amount of ergot in the grasses constituting the hay.

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TABLE

Showing Comparative per centage of Abortions in the town of Danube, for the three successive years, 1867, 1868, *and* 1869.

	1867.	1868.	1869.
Andrew Devendorf	.00	.00	.00
Wm. R. Stevens	.12½	.10	.05
Jonas Walrath	No report.	.11	.11
Jacob Walrath	.00	.00	.00
Mrs. Devendorf (Briggs tenant)	.17	.00	.00
J. E. Fox	.00	.00	.00
Lester Green	.00	.00	.00
H. N. Gros	.00	.00	.00
Arthur Jones	No report.	.00	.00
E. Miller	No report.	.11	.00
John Smith	.52½	.00	.03
Wm. Davy	.04	.06	.00
Peter Davy	.00	.00	No report.
George Rice	.00	.00	.00
Jacob I. Shall	No report.	.04	.00
Jacob Dillenbach	.17	.05	.00
Wm. Green	.10	.10	.10
James Bellinger	.00	.00	.00
Horace Bellinger	.00	.00	.00
Levi Walrath (1st)	.00	.00	.00
Washington Bellinger	.00	.00	.00
John W. Davy	.00	.00	.00
D. Cronkhite	.00	.00	.00
James H. Cronkhite	.00	.00	.00
Jonas Cronkhite	.00	.00	.00
Peter B. Smith	.00	.00	.00
R. Klock	.00	.00	No report.
Wm. Duesler	.00	.00	.00
S. & J. Clark	.00	.00	.00
Luther Dillenbach	.00	.00	.02
David Klock	.00	.00	No report.
J. N. Casler	No report.	.28	.00
David Harrad	No report.	.00	.00
R. Landt	.10	.28	.30
A. Schuyler	No report.	.18	No report.
John Shall	.00	.00	.00
Greene & Ostrander	.00	.00	.00
Marvin Walrath	.00	.05½	.04½
Mrs. Walrath	No report.	.00	.03
Alexander Fox	No report.	.00	.00
J. E. Fox (Smith tenant)	.00	.00	.06
Herkimer Green	.00	.00	.00
A. J. & S. Stafford	.00	.00	.01½
Jacob Shall	No report.	.00	.18½
Peter Shall	No report.	.00	.00
S. S. Doxtader	No report.	.00	.00
Levanus Devendorf	.00	.00	.00
Marvin Wilkes	.18	.10	.06
A. D. Hess	.16	.14	.09
J. P. Eysiman	.00	.00	.00
J. F. Bellinger	.06	.77	.00
M. Peck	No report.	.00	.00
S. Miller	No report.	.08	.00
John Gardinier	.00	.00	.15
Nelson Stafford	.00	.04	.00

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Comparative per centage of Abortions, &c.—(Continued).

	1867.	1868.	1869.
E. Coville	No report.	.00	.00
Chester Andrews	.00	.00	.00
D. Champion	.00	.00	.00
A. Decker	.36	.07	.06¼
E. Decker	.66	.00	.00
George R. Bellinger	.00	.00	No report.
Homer Petrie	.00	.00	.00
John Snell	.00	.00	.04
Daniel Bellinger	.04	.00	.00
N. N. Schuyler	.09½	.33½	.22
Philip Baum	.00	.00	.05
A. & P. Cramer	.00	.05	.00
J. J. Wagner	.00	.00	.08
A. Jones	.37½	.00	No report.
Francis Lewis	No report.	.14	.66
A. Miller	No report.	.00	No report.
Jos. Snell	.00	.05	.05
G. Spoor	.00	.00	.08
J. J. Richardt	.00	.00	.17
N. Ackerman (Donovan tenant)	.00	.36	.07½
Henry Haupt	.00	.00	.17
Edward Simms (Walter tenant)	.30	.24	.25
S. Jones	.00	.00	.00
W. & R. Jones	.02	.00	.00
David Davy	.45	.00	.09
C. C. Delong	.00	.00	No report.
G. H. & D. Wagner	No report.	.00	.00
D. Moyer	.00	.00	.00
Isaac Snell	.00	.00	No report.
H. S. Saunders	.00	.00	No report.
John Walrath	No report.	.00	No report.
J. & P. Monk	No report.	.00	No report.
Levi Walrath (2d)	No report.	.00	No report.
D. H. Moyer	No report.	.05½	.04½
John Conrad	No report.	.00	No report.
F. Wagner	.00	.00	No report.
J. H. Saunders	No report.	.00	No report.
H. Mesick	.00	.11	No report.
D. Johnson	No report.	.00	No report.
R. R. Mickle	No report.	.00	No report.
O. Flanders	.00	.00	No report.
J. Ostrander	.00	.00	.00
J. H. Stauring	.00	.04	.05
Calvin Harder	.00	.00	No report.
J. Walter	.07	.00	No report.
J. Hendricks	No report.	.27	No report.
S. G. Spoor (Van Allen tenant)	No report.	.14	No report.
S. G. Spoor	.00	.00	.00
A. B. Wagner	.00	.00	No report.

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MEMORIAL OF BENJAMIN P. JOHNSON,

READ BEFORE THE NEW YORK STATE AGRICULTURAL SOCIETY, AT THE ANNUAL MEETING, FEBRUARY 10, 1870.

By Marsena R. Patrick, Ex-President.

Mr. President and Gentlemen of the Society:

It is a wise provision of an All-wise Providence that when we have accomplished the work allotted to us in this world our bodies are laid in the grave "to mix forever with the elements," while our example, our labors and our achievements are left as a legacy to our successors, who, when their life-work is done, "in their turn, shall follow us."

As in the little laboratory of the growing plant that rises from the warm bosom of the earth, nutriment is extracted from the gases of the atmosphere, and from the varied elements of the mineral kingdom, as in that laboratory it is transformed from inorganic to organic forms and there fitted, by the vital process, to become the food of animal life, so, in the more thoroughly furnished laboratory of the animal, nutriment is derived, directly or indirectly, from vegetable organisms, which are there assimilated by a vital process of a higher type, and enter into the blood to be developed in the muscles, the fat and the tissues, that, in their turn, eventually become a more concentrated and nutritious food for the human race.

Nor does this process characterize the lower creation alone. One man gathers from the book of nature one class of facts, while his fellow gathers another class of facts, and still another class of facts is gathered by a third associate. Each uses his own facts for his own purposes, and then passes away; but whatever each has left, matured in his own laboratory, may enter into the life-growth of some *one* man who follows them, and be developed, through him, in forms of beauty and of power.

In society, everywhere, the leading spirits of to-day labor, each in his own sphere, and gather up the wisdom, the experience, the discoveries of their own times. But the times change. Man, in the

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maturity of life, changes little. As years pass over his head he is not always in sympathy with the spirit of the time present, and his conservatism is slow to change the systems *he* has organized and carried into successful execution.

The active spirits in society, after reaching a controlling influence, on an average, exercise that influence little more than a decade of years; then step aside, or are laid aside, that the representatives of the present may infuse into its councils the spirit and public sentiment of the day that now is.

But all the results of the labor, the experience, the failure and the success of those who have once molded and fashioned public opinion, are left as the heritage of each one who shall succeed them, thus enabling their successors, when entering upon their duties, to begin, not where they began, but where they left the work to which their energies had long been given.

In our own State Society, the strong, liberal-minded, energetic men who renewed its life and vigor, in 1841, are not its leaders to-day. Those who still live, and at times honor us with their presence, take part in our councils only on extraordinary occasions. Even the men of 1851, and five years later, still, with few exceptions, are not the men who do our routine work to-day, who manage the affairs and guide the policy of the Society. But the leaders of to-day, have grown up in the school of the past, under wise instructors, who were skilled in the signs of their own times, and who shaped their policy to meet the wants of those times most successfully. Let it be your high aim, my fellow members of this Society, upon whom the weight of responsibility for its management now rests, to emulate the noble example and to cultivate the same unselfish, generous spirit that animated Beekman and Delafield and Wadsworth and Faile and King and Rotch and Foster, and their honored compeers who have gone to their rest, for the policy that is born of a spirit like theirs must needs be successful.

Of all those worthies who were prominent in the re-organization of this Society in 1841, one individual, alone, has continued his active duties, as one of its officers, until within the last year.

Whose form was so well known to the members of this Society? Whose grasp was so cordial? Whose face so radiant with pleasure? Whose presence so venerable—standing up like a patriarch of old to welcome home his scattered sons to their yearly festival? Benjamin Pierce Johnson, the Vice-President of this Society in 1841, was its Corresponding Secretary in 1844, its President 1845, and its working

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Secretary from January, 1847, until he "laid himself down in his last sleep," on the 12th day of April, 1869.

In conformity with a resolution of your Executive Board, a paper, commemorative of his life and public services, has been prepared for this meeting.

About the middle of the last century, a Scotch surgeon, of some eminence in his profession, emigrated to this country and settled in the then province of Massachusetts Bay, not far from its western boundary. His name was "William Johnstone," but as there was another physician of the same name practicing in the vicinity, our Scotch doctor dropped from his own name the letters (t) and (e), ever thereafter signing his name "William Johnson." His son William studied medicine under his father, and was also in practice with his father during the revolution.

After the revolution, Dr. William Johnson, the son, became a resident of Canaan, Columbia county, where he owned and carried on a farm, at the same time that he was engaged in an extensive medical practice. It was while he resided in Canaan, on the 30th of November, 1793, that Benjamin P. was born, the youngest of six children. He was named for the late Benjamin Pierce, Esq., formerly well known in Columbia county.

Little is known of Benjamin's early life save, that he, with his only brother, William, was sent to school at Lenox, just across the Massachusetts' line, and there was fitted to enter college. Much of his time, however, was spent at home upon the farm, his fondness for agricultural pursuits exhibiting itself strongly while he was yet a mere boy. In 1810, at a little more than sixteen years of age, he entered Union College, then under the presidency of the celebrated Dr. Nott, who seemed to take a special interest in him, perhaps on account of his extreme youth, he being literally the Benjamin of his class.

It was, doubtless, owing to this kindly interest on the part of the president and his wife, that the boy student escaped many of the perils that surround the youthful college student, and his gratitude to the doctor was as fervent as it was lasting.

In 1813, he graduated, and having chosen the law as his profession, entered the office of John Foote, Esq., of Hamilton (who had married his second sister), and there commenced his legal studies. With his brother-in-law he studied a little more than a year, and then returned to his native county to enter the office of the late Hon. Elisha Williams, who was then regarded as the most prominent jury lawyer in the State.

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While in that office he made the acquaintance of a large circle of gentlemen of the bar, the friends, associates and admirers of the great advocate and luminary of the legal profession at whose feet he was sitting, and his retentive memory treasured up a fund of anecdotes, personal traits and reminiscences of the individuals that composed that brilliant galaxy of counsellors, jurists and advocates, which gave such character and reputation to the New York bar as has never since been equalled.

While the son was pursuing his studies in Hudson, Dr. Johnson, the father, became involved in financial difficulties, growing out of his connection with a cotton factory, which compelled him to dispose of his property in Columbia county, and seek a home farther west. He went to Oneida county, where he had a daughter, married to Hon. Charles Wylie (then on the bench as county judge), purchased a small farm near Rome, and, in 1816, removed there with his family. His son, William, lived with him and carried on the farm.

In the early part of 1817, Benjamin, having been admitted to practice as an attorney, followed his father and brother to Rome, where he opened an office, and commenced the practice of law. In 1820, he was admitted counsellor; not long after he was admitted to practice in the Court of Chancery, and then in the United States District Court. About the same time, he received the degree of A. M., from Hamilton College.

With his robust health, social disposition and popular manners, he speedily became a favorite in the community, and was elected to various offices in the county. He served his fellow citizens as a magistrate, school commissioner, supervisor, or member of assembly for more than a quarter of a century, to say nothing of his military achievements, which he used to recount with such infinite humor and gusto, when public business was laid aside, and which won for him the title by which he was so long and so widely known, both at home and abroad.

He was first elected to the assembly in 1827, and kept his seat three years. In Albany, he found himself among many old friends. De Witt Clinton, to whom he was warmly attached, personally, was in the gubernatorial chair. Ten years before, on the 4th day of July, 1817, and only a few weeks after his own arrival at Rome, he had stood by De Witt Clinton's side, on "that summit that divides the waters that find their way, on the one side by the St. Lawrence, and on the other by the Hudson, to the ocean," * and had seen the spade

* Geddes.

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struck into the earth, for the first time, to open a way for the waters from Lake Erie to the Hudson; he had heard him, and the men who labored with him, vilified, traduced and denounced as the wildest of visionaries; he had stood again on the same spot, eight years later, amid the waving of banners, the roar of artillery, the fan-fare of trumpets and the shouts of a multitude, to welcome this same man, "now Governor of the leading State of this mighty nation, surrounded by a people who were proud to do him honor, who appreciated the victory his statesmanship had won," * and bowed in homage to the genius that now rode in triumph to the sea, by the pathway of great waters he had prepared for them through a dry and thirsty land.

In those days there were giants in the land, and men of the very highest character were then found in the State Legislature. Erastus Root was speaker of the assembly, and among the members were Elisha Williams, the Gamaliel under whom he had studied law a few years before; Benjamin F. Butler, Robert Emmett, Ogden Hoffman, Luther Bradish, Millard Fillmore, Abijah Mann, Nathaniel P. Tallmadge, Francis Granger and John Van Buren, while in the Senate might be seen Cadwallader D. Colden, Perley Keyes, John L. Viele, Silas Wright, Ambrose L. Jordan, Peter R. Livingston and John C. Spencer, names that belong to the brightest pages of our State legislation.

With these gentlemen, and with his fellow legislators of all shades of political opinions, Col. Johnson was personally popular; his genial manners, freedom from party rancor, accurate memory, abundant anecdote and ready humor, making him always a desirable associate, whether on legislative committees or in the social gatherings, then so frequent in Albany during the sessions of Legislature. The acquaintances and friendships then formed, were kept up through the subsequent years of his life, and this Society has reaped valuable results from his association, in those days, with the representative men of a generation now almost extinct.

It was while Col. Johnson was a member of assembly, that the duty of revising the laws of the State was assigned to three distinguished legal gentlemen, to wit: John Duer, of the city of New York; Benjamin F. Butler, of Albany; and Henry Wheaton, of New York. Mr. Wheaton having been appointed by Mr. Adams, then President of the United States, Chargé des Affaires to the Court of Denmark, John C. Spencer, of Ontario, was selected by Gov. Clinton to fill the vacancy.

* Geddes.

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Committees were appointed from each branch of the Legislature to act in connection with these gentlemen, and were required to meet from time to time, in Albany, during the recess of the Legislature. Growing out of these duties, much of Col. Johnson's time was spent in Albany during the years 1828 and 1829, aside from the regular sessions of the Legislature, and with the close of the year 1829, his legislative career terminated.

Returning to Rome and resuming his former professional habits and manner of life, he began to give more attention to agriculture than he had previously given to it, carrying on a farm, rather for experimental than money making purposes, paying special attention to the improvement of stock, and keeping some very fine short horns, then but little known in the United States. As he became more interested in agricultural pursuits, and mingled with men of liberal minds, broad views and enterprising spirit, he saw, as they saw, that great advantage might be derived from an active, wide awake, working association, having for its object the development of the agricultural interests of the State of New York.

A State Agricultural Society had been formed in February, 1832, under the presidency of James Le Ray de Chaumont. "The results flowing from the organization of that State Society, owing to various causes, and especially the want of legislative patronage and encouragement, were not such as had been hoped for by the patriotic and devoted friends of agriculture. The meetings were annually held, and the ordinary business of the Society transacted, but there was little general interest manifested in the matter, and the funds of the Society did not warrant the establishment of annual fairs.* Still, much good was accomplished; public opinion was enlightened; much information was collected; and, under the patronage, and as the organ of the Society, the Cultivator was established, by Judge Buel, in March, 1834. Many important reports and papers were presented at the annual meetings of the Society, which will be found in the Cultivator. In 1841, the opinion of the agricultural community, as indicated by the public press, seemed to indicate that such an organization would receive the countenance and aid of the State. Accordingly, at the annual meeting of the Society, held at Albany, February 10, 1841, "the leading agriculturists of the State assembled in force, a new constitution was adopted, and a successful call made upon the Legislature for an appropriation of $8,000, per annum, for the promotion of agriculture and household manufactures in this State."

* A cattle show had been held in Albany in 1833, but no premiums could be awarded.

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With the adoption of the new constitution a new life was breathed into the old Society, a new era in our husbandry was inaugurated, and from that day agriculture, with its kindred sciences and arts, have, year by year, at each great annual exhibition, proudly vindicated this Society's right to inscribe "Excelsior" upon its banner.

At that reorganization of 1841 Colonel Johnson was elected Vice-President for the fifth Senatorial district; and at Syracuse, where the Society held its first fair, in September of that year, he seems to have attracted the attention of his associates in the Executive Board by his rapid and correct manner of doing business, as well as by his quick perception and admirable tact in the management of difficult matters, whether of persons or things, such as are inseparable from all great gatherings of a similar character.

In 1842 he still further exerted himself to awaken the spirit of inquiry among the tillers of the soil in his own section of the State by associating with the late Elon Comstock, of Rome, in the editorial charge of the Central New York Farmer, and at the same time by contributing frequently to the columns of the Albany Cultivator.

In 1844 he was Corresponding Secretary of this Society, under the presidency of the late Dr. John P. Beekman, the annual fair of that year being held at Poughkeepsie; and in 1845 he was President of the Society, the fair being held at Utica, but a short distance from his own home.

During all these years Colonel Johnson had led a very busy life. As a lawyer, practicing in the various courts; as a magistrate, and doing a large collecting business; as a school commissioner, receiving and disbursing public money; as a farmer and breeder of improved stock; as an editor and agricultural writer; to say nothing of the frequent demands made upon him as a public speaker on politics, temperance and other absorbing topics of the day. Generous in his feelings, open handed to a fault whenever his sympathies were aroused, and almost every member of this Society knows how quickly the tear started in his eye whenever his sympathies were appealed to, it is not to be wondered at that he was never a successful financier or manager of his own money matters, or that he became gradually and almost insensibly embarrassed in his pecuniary affairs until he suddenly found himself, in May, 1846, wholly unable to meet his engagements.

Too proud and sensitive to let his condition become known to friends who would cheerfully have extricated him from his difficulties, he sailed for Europe in the month of May, 1846, and was absent until

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late in the month of November following, when he returned to Rome, his affairs having been satisfactorily arranged by his friends so soon as the cause of his absence became known to them.

If we admit, as we certainly must, that he committed a grave error, let us remember that this very error of judgment in regard to his individual and private affairs has been productive of very great benefit to this Society and to the interests of agriculture throughout the United States. Obliged to husband his scanty resources while abroad, he plunged into the very heart of the agricultural districts, spending nearly all the time of that first visit to Europe among the cottagers and rural population of England and Wales, everywhere mingling freely with the plowmen and the reapers, the grooms and the herdsmen; studying the laborer and the soil, the tillage and the products, the system and the details of British husbandry, as they had never before been studied by any visitor from this continent.

For this study, the pursuits of his whole life had, in an eminent degree, prepared him. Few men in our day have equalled him in that special tact by which he could elicit information from persons of every class, and his long experience as a magistrate had still further developed this native power; while his deep interest in, and close observation of our own agriculture, joined to a very thorough acquaintance with the best works on the agriculture of Britain, admirably fitted him to seek out, and gather up, and store away, in that wonderful memory, whatever of value could be obtained from the actual cultivators of the soil.

Had he known, before leaving for Europe, the position to which he would so soon be called, he could not possibly have used his time more profitably in fitting himself for that position.

Shortly after his return to this country, and before he had fairly resumed business, some private or personal matter called him to Albany, just at a time when circumstances made it necessary to place some person of ability and experience in the business office of this Society as its working secretary. His very appearance in the city, at that moment, recalled to the minds of gentlemen on the Executive Board, his efficient services in the past, as Vice-President, Corresponding Secretary and President of the Society, while the fact that he had but just returned from Europe, and had not yet resumed his professional business at Rome, rendered it probable that he might be induced, for a time at least, to take charge of the Society's business. He was accordingly waited upon by members of the committee; the proposition was made to him, within a few hours was

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accepted, and on that same 21st day of January, 1847, Col. Johnson took possession of the office and entered upon those duties for this Society, which terminated only with his earthly existence.

And so does it often happen in life, that what appears to our short sighted vision as a calamity, and a calamity only, an all-wise and benign Providence overrules for our best good. Had no embarrassments interfered with the carrying out of his business projects in Rome, Col. Johnson would not have visited the rural districts of Britain in the manner he did; and had it not been for the few months suspension of his professional business, he would not have accepted the position in which he subsequently became so favorably known and so eminently useful to his country.

As Albany was henceforth to be his place of residence, he removed his family to this city in the year following, and Albany became his home for the remainder of his life. He had been twice married. On the 11th December, 1820, he was married to Miss Ann McKinstry, of Rome, who died on the 28th of January, 1837. Of the three sons and four daughters of that marriage, two sons, Alexander and Kirk, and one daughter, Rose (afterward Mrs. Woodbridge), reached maturity. On the 1st of March, 1838, he married, for his second wife, Miss Mary Adams, of Sherburne, Chenango county. Of the two children of that marriage, one died in infancy; the other, Benjamin W., graduated at Hamilton, in 1865, and soon after entered the Commercial bank of Albany, where he has since remained. For many years after he came to reside in this city, Col. Johnson's family consisted of his wife, daughter and two younger sons, Alexander, the eldest, having settled in Chicago.

With Col. Johnson's removal to Albany, came an entire change in his whole manner of life. He was now fifty-three years of age, in the full strength of matured manhood, in excellent health, having inherited a sound Scotch constitution which had never been impaired by disease, and, from the day he entered upon his duties as Secretary, his identification with the New York State Agricultural Society was complete and perfect. Giving up all other business he devoted his energies wholly to the development of the agricultural interests of his native State, and the promotion of every art and science that could be made available in good husbandry.

With quick perceptive faculties, a keen discernment of the thoughts of those with whom he was brought into association, and a memory exceedingly retentive of whatever impressed the senses from without, or the mind from within, he rapidly acquired a vast amount of informa-

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tion bearing upon those subjects which it was the object of this Society to foster, and all this store of facts, suggestions, ideas, principles and details was so perfectly at his control, in writing or speaking publicly, or in conversation, that it was not long before Col. Johnson became an oracle to the great mass of the farmers of this State, with whom he came in frequent contact. With his genial manner and pleasant word, and hearty grip, as he shook the hands of our sturdy farmers and called each one by name, among the thousands gathered at our State fairs, answering a score of questions at once on as many different subjects, his pen all the while running rapidly upon a train of thought entirely distinct from all, it is not strange that he should be regarded as an oracle by those who met him from time to time, in a business way, through so many years of cheerful but unceasing labor for their good.

The Society's office became the depository of every fact, suggestion, product or invention connected in any way with agriculture and the domestic arts, which, after passing through the laboratory of his brain, were sown broad-cast over the land, through the medium of the press, and of addresses, almost without number, that he was invited to deliver before county societies, town clubs, and fairs of various kinds in our State, as well as before kindred associations in many other States. The management of our State fairs was reduced to a very perfect system, and became the model for societies in other States. In the establishment of many of those societies his presence was called for, and his assistance in nearly all. In the formation of the United States Agricultural Society, in 1852, he took an active part, being one of its vice-presidents for many years, and his experience was invaluable on its executive committee as well as in the successful management of its fairs, and especially in the competitive trial of machines and implements at Syracuse, in July, 1857.

In these duties and labors, he had, undoubtedly become more thoroughly conversant with everything distinctively "American" in our system of husbandry, and especially in the adaptation of machinery to agricultural purposes, than any other man in the United States; and, in this, we again recognize the guiding hand that was preparing him for a special work in the old world.

Of the inception and carrying out of "the idea of a British exhibition of the industry of all nations" it is unnecessary now to speak, save, perhaps, that the idea probably grew out of the French exhibition of of 1844, and was matured and carried out through the influence of the Society of Arts, backed by the powerful aid of Prince

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Albert, its president. On his application, an order was issued for a royal commission to mature plans, raise funds, and make all needful arrangements for the great enterprise.

Numerous designs for a structure suitable for the exhibition were submitted by eminent architects, and a plan had been agreed upon, but obstacles presented themselves in their execution, which caused Sir Joseph Paxton to be invited to meet the commission. Sir Joseph immediately presented an entirely new and original plan for a structure of iron and glass, rising from sixty-four to 110 feet in height, and covering more than eighteen acres of ground. This plan was accepted and a contract made at once for the construction, Messrs Fox and Henderson being the contractors.

Then, for the first time upon earth, appeared "a sea of glass," and, as if by magic, the vast fabric rose, complete and perfect in all its parts—a crystal palace for the exhibition of the industry of all nations! A monument, alike to the genius of Sir Joseph Paxton, the ability of the contractors, the skill of the artisans and the available resources of Britain.

In response to the courteous invitation of the royal commission, our own government appointed a commissioner for the United States, and one or two assistant commissioners. His Excellency, Gov. Fish, in behalf of the State of New York, appointed a committee to examine and certify articles intended for the exhibition, presented by our own citizens. Hon. Luther Bradish, Gen. Adoniram Chandler, Charles Henry Hall, Esq., Ezra P. Prentice, Esq., Hon. Benj. P. Johnson, Hon. Anthony Van Bergen, Hon. Zadock Pratt and Hon. Wm. Buell, constituted that committee, which was organized in the city of New York on the 27th August, 1850, with Hon. Luther Bradish as chairman, and Col. B. P. Johnson as secretary. The labors of the committee were greatly increased by an order from Washington authorizing persons from other States to make their entries through the New York committee, after the time for receiving entries, as originally made, had expired.

The United States frigate St. Lawrence was designated to transport these articles across the ocean, and arrangements were made by the commissioners for their reception and exhibition in London. Space sufficient for the display of all articles *expected* to arrive from the United States was claimed by the United States commissioners, and a suitable quarter in the great building was assigned them.

The exhibition was to be formally opened on the first day of May, 1851, but, from some unlooked for delays, many of the expected con-

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tributions from the United States did not arrive in due time, and the meagre display in the extensive area assigned to the United States, gave rise to many jocular expressions as to our national characteristic, of claiming more territory than we could occupy. By popular consent, the American quarter was christened "The Prairie Ground." Anxiety and mortification were beginning to be felt, very keenly, in the United States, lest our country should lose the prestige it had gained in the eyes of foreign nations; and especially was this feeling growing strong in this State, from which so many contributions had been forwarded.

It was under such circumstances, that Col. Johnson sailed from New York, on the 16th of April, 1851, in the steamer Baltic, having been appointed by His Excellency, Gov. Hunt (who had succeeded Gov. Fish), "to represent the interests and honor of the State of New York, at the exhibition in London." On the last day of April he reached London, and on the morrow, the time-honored, joyous "May-day of merry England," the grand exhibition was duly opened by the British Queen, surrounded by all that was dignified and noble in her own vast realms, as well as by the representatives of every crown in Europe, and of almost every nation in the civilized world. Never before, in the history of our planet, had majesty, and authority, and power, met to do homage to labor; and the May-day of 1851, inaugurated a new era in the world's history.

Already known to the leading agriculturists of England and Scotland, as the Secretary of the New York State Agricultural Society, by his correspondence with their own societies, Col. Johnson was placed on one of the most important of the juries at the opening of the exhibition — that of "agricultural implements and machinery" — but being personally known to the great body of exhibitors from the United State, his services were demanded by *them* in bringing forward their own contributions, and securing for them, each, a fair examination. These services were heartily rendered, and were invaluable to the United States assistant commissioner, the commissioner from the United States having been called home, at an early day. It is not too much to say, that the Colonel's tact, energy, and experience in the working of exhibitions, contributed *very largely* to the ultimate success of American exhibitors.

Passing through the grand avenues of this magnificent temple of the arts, with the brilliant procession on "opening day," *his* eye had wearied of the splendor that marked the offerings of the old world, regal in their luxury, gorgeous in their adornments, profuse in their

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decorations; swallowing up years of the labor of countless hands that seldom, or never, had known the pleasure of receiving for that labor sufficient food and raiment for their bodily comfort. Tapestry of Gobelin and porcelain of Sèvres; laces of Honiton and velvets of St. Etienne; damasks of Spitalfields and brocades of Lyons; silks from India and cashmeres from Persia; ermines and sables, of fabulous price, from the hyperborean domains of the czar, were there, intermingled with colossal statuary, tigers and amazons in bronze, Greek slaves in marble, exquisite paintings and sparkling fountains; chess-men of gold and silver, studded with rubies, each the costumed portrait of a reigning sovereign, with their retinues of bishops and knights, and men-at-arms and castles, moved on squares of tortoise shell and mother of pearl; tables of solid silver were there, wrought into forms of wondrous taste and beauty; pyramids of gold from the shores of the Pacific and the deep mines of far-off colonies; glittering gems and priceless jewels of imperial crowns flashed their splendors on the scene. Even the far-famed Koh-i-noor — the mountain of light — itself the value of an earldom, added its lustre to dazzle the eye, and carry captive the multitude. No wonder that the multitude were dazzled by such lavish display of aristocratic wealth and imperial splendor; or that remarks, little complimentary to the great republic, should fall from the lips of those whose eyes, for the first time, rested on the comparatively meagre display of homely articles, scattered, here and there, over the "American Prairie."

Col. Johnson comprehended "the situation" at a glance; and with a hearty determination to become "master of the situation," threw himself, body and soul, into the work that would, in his judgment, best attain the end. In his former visit to England, he had thoroughly studied the systems of British plowing and British havesting, and none better understood the difference between *those* systems and our own. Necessity, the mother of invention, had compelled our people to reduce hand labor to the lowest minimum, and to economize power to the greatest extent practicable in the operations of the farm. His position as a "juror on agricultural implements and machinery" afforded him special facilities for making the acquaintance of those most interested in agriculture, both in the British isles and on the continent. To these gentlemen he first explained the principles involved and the objects sought in the construction of our *plows*, and so favorably did he impress their minds, that, although the *trial* of agricultural implements had already taken place, before his arrival (under an arrangement with the Royal Agricultural Society of Eng-

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land), and when no person familiar with the use of *our* plows was present to manage them, they determined to apply for another trial.

Baron Mertens d'Osten of Belgium, and Professor Moll of France, joined with Col. Johnson, in an application to the royal commission, "for a trial of the English plows, to which prizes had already been awarded, with foreign plows," the draught to be tested by "dynamometer." The application was successful, so far as a *trial* was concerned, but the plows of *each nation were to be judged separately.*

The trial came off at Hounslow, on the 19th of July; twenty-one foreign plows being tried; from France, Belgium, Germany, Austria, Bohemia, Canada and the United States, as also five English prize plows.

It is not necessary to follow up that trial, of which the results are so well known in this country, further than to say, that the plows from the United States were sold before leaving the trial grounds to the best farmers in England, and orders given, on the spot, for very many more to be shipped speedily from New York. Public attention was thus turned, suddenly, to American implements, and the public mind became greatly interested in the trial of the reapers, which was to come off on the 24th of July, on the Tiptree Hall estate of Alderman Mechi, the model farmer of England. Farmers and gentlemen were there assembled from all parts of the kingdom. The day was bad, the rain falling and the wheat green. The "Hussey" machine was started, clogged; started again, and passed over the grain without cutting it. After three failures, some of the jurors proposed to give up further trials and leave the field, but Col. Johnson insisted upon trying the other machine. Through courtesy, alone, the jurors yielded to his request, and when Donald McKenzie, of Livingston county, mounted the McCormick reaper, it was a moment of intense anxiety to the three or four Americans present. One of the two machines had been tried, and failed. The expression, from the mouths of these sturdy Britons, was the same on all sides; "we expected it; these machines cannot work until they have been perfected by an English mechanic." The farm laborers who had, at first, some fears that their vocation was in danger, were jubilant over the defeat of the Hussey.

At the word, McKenzie started, and before the machine had moved its length, the tide had turned and the victory was won! You know the rest. Its clean path, as it moved smoothly along the field, was enough; and when Alderman Mechi jumped upon the platform and called out "three cheers for the American reaper; as Englishmen,

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let us give these Americans three hearty English cheers;" they did send up three rousing cheers and a tiger after them.

From that time until the close of the exhibition, the "American Prairie" was crowded with visitors of all ranks and conditions in society. Every implement was studied, and the Colonel was in constant demand to explain their various objects and manner of working. Royalty made his acquaintance, and sat delighted in Yankee rocking chairs while the prince consort sought to make himself acquainted with every new or improved implement that might be made useful in British husbandry. The whole tone of public opinion had undergone an almost miraculous change. The press turned from ridicule to investigation, and then to laudation of American inventions. Even the Thunderer's growl was hushed for a little, and when his voice was heard again, it was in tones of satisfaction and approval; remarking "that every practical success of the season belonged to the Americans; their consignments showing poorly at first, but turning out well on trial." Adding, at a latter day, when Steers had astonished their yachtmen, and Hobbs had picked their Bramah locks, and Bigelow's looms had thrown off the richest carpets of Brussels, "Not only has their reaping machine carried conviction to the heart of the British agriculturist, but their revolvers threaten to revolutionize military tactics.

* * * Their yacht takes a class to itself. Of all the victories ever won, none has been so transcendent as that of the New York schooner. The account given of her performance, suggests the inapproachable excellence ascribed to Jupiter, by the ancient poets, who describe the king of the gods as being not only supreme, but having none other next to him. 'What's first?' 'The America.' 'What's second?' 'Nothing.' Besides this, the Baltic, one of their steamers, has made the fastest passage yet known, across the Atlantic, and, according to the American journals, has been purchased by British agents for the purpose of towing the *Cunard* vessels from one shore of the ocean to the other.*

For the signal triumph of American genius and skill at the great exhibition, our countrymen were largely indebted to the intimate acquaintance of Col. Johnson with the peculiar traits of Englishmen, their agricultural wants, and the adaptability of many of our own implements to meet those wants; though English prejudice was so strong that it required all his tact and indomitable perseverance,

* See London Times of 2d September, 1851.

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backed by the influence of our popular minister, Mr. Lawrence, to bring these contributions fairly before the British public.

On the 9th of August, 1851, Col. Johnson, with a number of his distinguished associates, by the invitation of the French emperor, left London for the city of Paris. They were received by the authorities of Boulogne and Amiens, with much of the display that belongs to imperial governments, while en route for the capital.

In Paris, the Colonel was introduced, by Mons. Vattemare, his friend of former years, to the most prominent members of the French academy, and to the leading minds in the various departments of the government. A special meeting of the national agricultural society was called, and he was honored by the presentation of the society's medal of membership. He, there, made the acquaintance of, and entered into arrangements for correspondence with, such representative men as Buffet, Vaillant, Chasseloup-Labat, Neiwerkerke, Magne, Leon Faucher, Chevreul, Decaisne, Brogniart, Payen, Vilmorin, Robinet, De Merlieux, Desaq, De La Roquette, D'Arblay, De Beaumont, Becquerel, Garcin de Jassy and Bossange.

A grand review was given by the emperor, in honor of his guests, in which 30,000 troops were brought into line on the Champs de Mars, and was followed by a brilliant fête at St. Cloud, which closed the festivities of the occasion, and the distinguished guests returned to London.

In the month of September, Col. Johnson returned to this country, in time to be present at the autumn fairs. Our State fair was held, that year, at Rochester, under the presidency of the lamented Delafield, and brought together an immense number of people from other States, as also from Canada; the late Lord Elgin, then governor-general of Canada, being present with a number of distinguished foreigners. The services which Col. Johnson had rendered abroad, were gratefully recognized everywhere at home, and, for the next three years, no agricultural society felt that its full duty to its members had been performed, until it had secured from *him* some portion of *his* unwritten history of the great exhibition; a history which was given in that rich, unctuous and racy style so peculiarly his, and which was all his own. What though a few of us may have heard his description of some of these scenes more than once! It was because we chanced to be with him when he was called out by others.

For the next ten years of his life, from the autumn of 1851 until the spring of 1861, Col. Johnson was indefatigable in the work to which he had been called by this Society, gathering up information

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from every quarter; sifting, digesting and assimilating it to the wants of our people, co-operating with Mons. Vattemare in his system of exchanges, corresponding with Vilmorin, De Nottbeck, Mettermeier, Dr. Lowenheim, and their compeers on the continent, with Pusey and Challoner, and Mechi, and the many eminent agriculturists of the British isles, as well as with the most advanced leaders in agriculture, wherever found, he obtained for our farmers whatever was valuable, or worthy of trial, from almost every nation on the face of the globe. During these years, he carried on a large correspondence with distinguished individuals at home and abroad, and was honored with membership by Russian, Brazilian and several other foreign societies, for the promotion of agriculture and the mechanic arts.

It is to be regretted that his time was so fully occupied with the current business of his office, until laid aside by age and infirmity, that he was never able to arrange the great mass of his correspondence, so as to be available to those who come after him. Save to extract, from the letters daily received, whatever seemed valuable at the moment for publication in the Society's monthly journal, no further use was made of them, and they were consigned to boxes until a more convenient season should give him an opportunity to place them in a form accessible to others. Let those who hold in their hands manuscripts and documents of value to the world take warning from his example, and if unable, themselves, to arrange such papers for future reference, call to their aid those who will do it for them, before it is too late.

Col. Johnson wrote for the press continually, and in his hands the monthly journal of the Society (established in 1854), became the means of disseminating much valuable information among our farmers, while the annual volume of the Society's Transactions became one great storehouse of agricultural treasures, gathered, with unremitting labor, from all sources and in every land. Indeed, it is but to repeat what has often been said by leading men in both Europe and America, when it is affirmed that no other series of volumes, issued from any press, are of greater practical value to farmers than the Transactions of the New York State Agricultural Society. Long may these reports continue to lay before our people the results drawn from the every day experience of practical men engaged in every branch of husbandry, as well as from the investigation of those great laws that govern matter, dead or living, by the trained devotees of science.

In 1853 Colonel Johnson took a large share in the national exhibi-

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tion of the New York Crystal Palace, and devoted much time to its duties entirely at his own expense. For the cause of agricultural education he was, from the first, a most earnest and eloquent advocate, urging it upon the people of *this State*, especially, with voice and pen, whenever an opportunity was presented for him to make such appeal.

In 1853, with Delafield, King, Wager, Buel and their still surviving associates, he became a trustee for the State Agricultural College; and when John Delafield, the chairman of the board, was stricken down in the midst of his usefulness, none labored more earnestly for the reorganization and enlargement of the board, as authorized by the act of February, 1857. With the late Governor King as chairman, in place of his friend Delafield, the trustees went forward with the enterprise, and finally saw it opened for the reception of students but a few weeks before the outbreak of the war. Had not that war burst upon us at that critical moment of its history, the college might, perhaps, to-day have been in successful operation. But its work was not in vain, inasmuch as it prepared the way for, and was instrumental in, the establishment of an institution so richly endowed by private munificence, that the State *could not* withhold from it a still more ample endowment from the national domain, though it had refused the *smallest portion* of these lands to the State Agricultural College already established.

Upon few northern men did the great fact of the war fall more sadly than upon our friend. In the southern States he had many warm personal friends, especially in Maryland, Virginia and Kentucky. Strongly anti-slavery as he had ever been, he had greatly mistaken the character of a portion of his countrymen, and could not believe that any circumstances would make a war between the States possible. But the war became a reality, and the husband of his only daughter entered the navy as a paymaster, and his second son followed, leaving the Colonel almost alone, his youngest son being at school and the eldest settled in the west. His wife, too, on whom he had almost wholly relied for years to manage all domestic affairs, had become quite an invalid from an accident on the Albany northern railroad a year or two previous, and for the first time, perhaps, he began to realize that his seventy years of life were almost spent.

But he had work yet to do for his country, work that none knew so well how to execute, and though he could not march to the fight with those who did battle under the stars and stripes, he could as effectually uphold the honor of his country in a foreign land and on the field of his former triumphs.

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The international exhibition of 1862, like that of 1851, owed its origin to Prince Albert and the Society of Arts, though the prince was not permitted to witness the success of the enterprise, having died on the 14th of December, 1861. The royal commissioners, charged with the management of the exhibition, having extended an invitation to this country, the subject was presented to Congress by the President in 1861, and an appropriation of $2,000 was made to defray the expenses of preparing a representation for the exhibition. A commission was appointed with William H. Seward, Secretary of State; Caleb Smith, Secretary of the Interior; Edward Everett, Robert B. Minturn, Joseph Henry, J. H. Klippart, J. R. Partridge, G. D. Coleman, R. Wallack, W. W. Seaton, Eli Whitney, J. C. G. Kennedy, and Benjamin P. Johnson, as its members. The commissioners met in Washington, October 15th, 1861, and organized with William H. Seward as chairman and Mr. Kennedy as secretary. An Executive Committee, with Col. Johnson as chairman, was appointed, an office opened, and applications received for entries from seventeen States in twenty-eight of the thirty-six classes into which the exhibition was divided; a very large contribution indeed at any time, but especially in a time of civil war.

The proceedings of the commissioners were reported to the President, and by him to Congress. It was referred to the committee of ways and means, in the House, by whom an appropriation of $35,000 was recommended to defray the expenses of exhibitors; but, with the country involved in war, all other interests were postponed for the present, and the appropriation failed in the House, as did a like recommendation subsequently made, in the Senate. As a consequence, most of those who had entered articles for the exhibition, withdrew them; but many of those who had already forwarded their articles to the agency of the commissioners, in New York, decided to go to London.

Mr. Holmes, the agent of the commissioners at New York, having received an appointment as agent for a large portion of those who thus decided, was furnished with credentials to the royal commissioners, requesting them to allow our exhibitors to enter their articles, and permit Mr. Holmes to take charge of them as assistant commissioner from the United States. At the same time Col. Johnson, who had been appointed, by President Lincoln, commissioner from the United States, wrote to the royal commissioners, that he would be there at an early day to take charge of the contributions from this country.

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On his arrival in England, he was most cordially welcomed by the royal commissioners, Earl Granville, president of the council, as also several others of the commission, having been his associates at the exhibition of 1851. Although there were but ninety-five entries from the United States (against 599 exhibited in 1851), every facility was afforded to give them the most favorable presentation, the commissioners expressing their regret that our nation was not more fully represented. And this regret was more strongly expressed by the representatives of other governments, when shown the original list of entries at Washington, as many of these representatives had been instructed to secure samples of our implements and machinery for their respective governments.

If proof were wanting of our success in that exhibition, which was on a much broader scale than that of 1851, it would be found in the fact, that of the ninety-five articles exhibited, eighty-three were awarded prizes—a much larger proportionate number than was awarded to any other nation; while in the class of machinery, in which England was eminently successful, of the twenty-eight American exhibitors, *every one* was awarded a prize; and the same result, too, in the class of agricultural implements, where competition was strongest, *every one* of our implements being awarded a prize. It is unnecessary to follow up this exhibition; for no sooner had the awards of the 615 jurors been officially announced than "the United States department was crowded with visitors to see what had come to benefit the world, from that land where a contest, unexampled in the history of our race, was being carried on."* The press, as in 1851, took up the articles exhibited, in detail, "and advised the public to give special attention to the valuable inventions from the United States."†

But, notwithstanding our success in this great exhibition, and the pleasure of again meeting, in fraternal intercourse, with the best and noblest of Europe, the Colonel's heart was sad, and he longed to re-cross the ocean; for his country was in peril, and he feared that his own home would soon be desolate. So soon, therefore, as he could leave the exhibition, he bade a final adieu to the many friends he had made in England, and took passage for New York. The letter of the Earl of Granville, president of the council, to Col. Johnson, as he was about to leave, is couched in such terms of high personal regard, blended with such graceful recognition of his public services, that it leaves no doubt as to England's estimate of his character.†

The Colonel reached this country in October, and not too soon;

* London Times. † See letter of Earl Granville, page 6, Commissioner's Report.

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for within a few weeks thereafter the calamity he had feared came suddenly upon him. On the 1st day of December, Mrs. Johnson died. Mr. Woodbridge, his son-in-law had died in service, in the December previous, and Mrs. Woodbridge, with her young daughter, returned to her father's house to contribute, as only a daughter can, to the comfort of a father in his declining years. His threescore years and ten had been reached, and, from the stroke that had fallen upon him, he never fully recovered; though he rallied bravely, and at times appeared to renew the strength of his perfect manhood.

To those friends who knew him well, it was painfully evident that decay was making rapid progress with his, so long, vigorous constitution, and it became necessary for those to whom he had looked for counsel, and who were bound to him by many ties, to take such measures as would, quietly and gently, relieve him, from year to year of many of the burdens of his office. To have dropped him from the rolls of the Society as its Secretary, would have been to pronounce his sentence of death. So kindly and delicately was he relieved from his duties, one by one, that, as his faculties waned, he was scarcely conscious that he was no longer the animating spirit and executive officer of the Society. The close of the year 1866, had found him much reduced in strength; but, with the commencement of 1867, afflictions came upon him that well nigh overwhelmed him. His oldest son, Alexander, died in Chicago, on the 24th of February, while his second son, Kirk, was lying on a sick bed, at his father's house, from which he, too, was carried to his grave on the 18th of April following.

Through the summer and autumn of 1867, the Colonel struggled manfully against the lethargy that was stealing over him, and, for the last time, attended our State fair, held that year at Buffalo, though without any anxiety as to his duties, their performance having been otherwise provided for. On the 12th of February, 1868, he met the Society for the last time, in this room, but was obliged to retire before the meeting closed. Through all the following months of 1868, he slowly wended his way toward that bourn whence no traveler returns. At our last annual meeting, for the first time in twenty-eight years, his seat at our board was vacant, and his strength was almost gone. Watched over, tenderly and lovingly, by his two surviving children, on the 12th of April, 1869, his heart ceased to beat, and his spirit ascended to Him who gave it. His remains were followed to the grave* by as many of the officers and members of this Society as could reach here from other parts of the State, as well as by the many

* The remains were interred at Rome, in the burial ground of the Johnson family.

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friends he had gathered around him during his residence in this city. In that grave may his honored dust remain, until that day when all that in him was mortal shall have put on immortality, and, in his glorified body, he shall behold Him in whom his soul had so long trusted as its Savior.

No sketch of Col. Johnson's life would be complete that did not recognize in him the controlling power of religious principle—of a living faith in the Son of God—that faith which worketh by love, that purifieth the heart, that overcometh the world.

Until the close of his thirty-second year, Col. Johnson had been wholly indifferent to the subject of religion, if not openly opposed to it. About that time (1825) the celebrated Charles G. Finney arrived at Rome, and began to preach to the crowds that flocked to hear him. Impelled by curiosity, the young lawyer dropped in one evening to ascertain wherein this man's strength lay. If there are any present who knew Mr. Finney in those days, it is needless to remind them of his wondrous power in the pulpit. His was just the style of eloquence to arrest the attention of a man like Benj. P. Johnson, and hold it captive until his powerful logic should complete the victory. Such was the result in the case of our young lawyer, who was early converted, soon afterward made a public profession of his faith, and became a member of the Presbyterian church in Rome.

To him a profession of religion was something more than an observance of its forms, and he became a most earnest and active Christian. With his emotional nature, his warm sympathies, and ready command of language, he became prominent as a public speaker in all gatherings of a religious character, taking an active part in establishing Sabbath schools, and in the temperance reformation of those days. Indeed, so efficient was he in all enterprises having for their object the promotion of morals and religion, that, by advice of the Presbytery of Oneida, he was licensed to preach the Gospel, and, for some time, supplied the pulpit of the Second Presbyterian church in Rome, to the acceptance of the church and congregation.

For a time, he thought much of abandoning law for divinity, but the duty he owed to his family, and the impossibility of suitably providing for the wants of those dependent upon him, while he should be pursuing a course of studies in theology, finally determined him to adhere to the profession in which he had been trained. With the settlement of a pastor over the church to which he temporarily ministered, he left the pulpit, no more to enter it; but during all the remaining years of his life, and wherever duty called him, until laid

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aside by age and infirmity, he was one of the most efficient laymen of the church with which he was connected.

And now that this faithful public servant, and devoted friend of this Society has passed away, let us each endeavor, to the best of our ability, to carry forward the great work to which the last thirty years of his life were dedicated; to emulate his example in his rigid adherence to the objects for which the Society was organized; in his conciliatory bearing toward those with whom he was compelled to differ, and in the cheerfulness with which he laid aside his own preferences when the good of the Society might thereby be promoted.

That this Society may, hereafter, number among those who shall fill the chair he vacated, men of more profound intellect, of higher culture, and greater attainments in science, is quite possible; that it may have one better fitted for the work to be done, and the time of doing it, is quite *impossible*. To use the language of one who knew him well, through very many years of his life, and in all the phases of that life, "He was the State's best servant. Never man served the people to higher result of value, and received so little for it."

Among the many articles that appeared in the home and foreign journals, when Col. Johnson's death was announced, some were both discriminating and appreciative; none more so than one from the pen of the writer just referred to, and with a quotation from him this paper may appropriately close. He says:

"I knew him well, and greatly admired his possession of so many qualities for that office, which rarely blend in one person. Something of a scholar, quite a lawyer, with experience as a statesman; a thorough farmer, with great opportunities of foreign travel, for in his first journeys in Europe he shunned (*ex necessitate*) all of his own rank in life and learned the truth of the cottager's life, while in his subsequent journeys he went accredited, and was on a footing with the best of culture and the highest in rank. Brusque, and yet winning and attracting friends; sedate, yet with it fond of good talking and social life; all this, wonderfully blended, made him, I think, the foremost agricultural official in the world! When in England, he led our delegation, and in his custody our department was visited by the royal family. In that series of visits, the mornings being exclusively for them, his conversations with the Queen and Prince Albert were familiar, though always well bred, to an intimacy such as probably no other American gentleman has ever held. How rich his conversation, of anecdote about all this; often repeated, it is true, but it was a bright *cheval de bataille*, ride he it never so often. He

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rejoiced in a good, noble hearted man, he suffered in the contact with meanness and narrowness. I knew how dearly he loved some men, and how he but just endured others. What has not agriculture become since he took the helm of the State Society? Labor has been revolutionized, machinery has become humanity. His work was greater than his fame. He labored for a broad field which confessed the harvest, but did not fully see the workman. Were I to speak of him as he grew into the mind and love of a few men, I should use eulogy some would say was overwrought. I therefore temper the praise, though I would gladly give full proof of its depth.

To the gentlemen of that great Society I leave their old Secretary, who for them lived and with them died. I leave him to their affection; to a nation's gratitude. The first debt that Society will pay, is paying now; the last will never be paid. But my own heart has a power of voice to itself, if it does not touch others, when it says: 'This man made the earth on which he dwelt a happier home for his fellow men, by his life.'" *

* "Sentinel."

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MEMORIAL

OF

HERMAN TEN EYCK FOSTER.

PREPARED BY HON. A. B. CONGER, EX-PRESIDENT OF THE NEW YORK STATE AGRICULTURAL SOCIETY

PRESENTED AT THE ANNUAL MEETING FEBRUARY 9, 1870.

Our Society deplores the loss of one who, for many years, honored its confidence in varied official service. The social circle in which he moved, mourns a most generous and dearly esteemed friend, and the benevolent world an ardent and successful fellow laborer.

Herman Ten Eyck Foster died on the 9th day of February, 1869. His death was a surprise, even to those who witnessed it; without preparation to all, save himself.

An accident early on the morning of the 27th of January, which resulted in a fracture below the left kee, remanded him to his couch. The injury was not deemed serious; every symptom promised early convalescence. While his family were rejoicing in the indications of a complete restoration to useful and wonted labor, and as one of his children was reading from a recent publication, some witty thought produced a general merriment. His hearty laugh was quickly arrested by a sense of faintness. The reading ceased at his request, and his head was laid on the pillow. Consciousness was quite suspended, and as it returned he said to a daughter ministering to his relief, "I was almost gone." Instantly the blood surged over his riven heart; the cord which bound him in time was severed, and his spirit, released from earth, ascended to its eternal abode.

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He was born in the city of New York, on the 1st of March, 1822, the third son of Andrew Foster, a merchant of Scotch birth, and Anna Ten Eyck, an Albanian of Holland lineage.

At the age of fifteen he entered Columbia College, and in due course received his degree as bachelor of arts. Spending a winter in the trial of mercantile life, his tastes, and perhaps also a regard to his health, prompted him to the study of farming, which he pursued for a year at Jacksonville, Tompkins county, under the supervision of Mr. Aaron K. Owen.

His choice of a pursuit in life was soon and wisely determined, and Lakeland, an estate of nearly 250 acres on the east shore of Seneca lake, was purchased in June, 1843.

Two summers had passed, and when the landscape was clothed in the gorgeous tints of October, he brought to his house, to make it their home, Pauline, a daughter of Mr. Antoine Lentilhon, a French resident of New York city. Four and a half years passed, and a son and two daughters were born, the jewels which the mother wore to the delight of the doting husband and loving father. Then suddenly she was called to a higher home, of which that on earth was, in the ministries and grace of love, the type.

What was the weight of that affliction on his heart, it is not ours to reveal. We note only its traces in his life. The main current of his earthly affection, thus severed, was soon observed to join itself to its tributaries, and swelled his affection and care for his bereaved children. From the tutelage of grief he passed to an inward culture, which gave him hope in his patient waiting for a blessed reunion, took from death its accustomed horror, and led him to express a boding joy in the day of his release. Not that such expressions were frequent, but rather elicited at times of rarest confidence, or brought out in sympathy for some similar trial. Only was it possible for the nicest observer, and that on few occasions, to read in the depths of his fixed eye, the traces of that deeply felt and long borne sorrow; to understand how inwoven with his placid smile and almost gay urbanity, was that weird, yet staunch earnestness of feeling, which gave to his convictions of duty their true inspiration.

His near neighbors best attest his love for the highest good of their families, as they point to the Sabbath school which he originated, and sustained for nearly nineteen years. His assistants in his work, and his scholars, will not soon forget his labor of love in the prayer meeting on the eve of preparation, which, though recently established, evinced his intense yearning over their religious welfare.

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Nor will those who shared his nearer confidence fail to be animated by the example of fortitude, which kept him tied to his work even in periods of exhaustion, or of that enthusiasm which, in the deep interest of his work, was oblivious of fatigue.

The sentiments of respect manifested in the last tribute to his remains, the irrepressible emotion, the quiet utterances which spoke his loss and his worth, are the enduring evidence that his genial nature, expressing itself in words and works of kindness and just regard for the welfare of all of human mould, had fully wrought out its mission, and that in his life's journey, he has left

"Footprints in the sands of time.

"Footprints that perhaps another,
Sailing o'er life's solemn main,
A forlorn and shipwrecked brother,
Seeing shall take heart again."

For such a spirit, farming was not simply a business or the occupation of time. It was communion with nature in her marvelous work, not merely a matter of study or inquisitive search into her hidden mysteries; it was a love for her display in the leafy garniture of her forests, in the heaving bosom of her lakes, in the rippling courses of her rivulets, in the rounding of her hill sides, in the craggy summits of her mountains, not less than in her verdant meadows, or her ripening grain. Hence, his pursuit after her rewards in the labors of the field, or the handiwork of the garden, was ever fresh and joyous. It was less of a task than a pastime. Happiness and hope were, as they should be, its moving forces. The methods, however, were those which experience and science had approved, whether in the wise adjustment of means to ends, in the provident adaptation of every work to its season, or in the plans and purpose of a steady progress. The proof is in the result. Without any lavish expenditure; without fretting out or vexing his noble nature on unforeseen contingencies or petty mishaps; with every enjoyment of life, in the rearing of his children, in unbounded hospitality to his friends; with time freely spent in works of benevolence, and not a little spared to his official duty in advancing the cause of agriculture—his farm had, under his wise and happy management, more then trebled its original power of production and quadrupled its value.

We note as commendatory evidence of his success in the management of Lakeland, that, as early as 1848, he received at the hands of our State and of his county society, the first of the several prizes offered for farms systematically and profitably cultivated.

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To those who had not with him looked over his convenient shelters for stock, produce and implements, the plan of his buildings as given in the transactions of our society for that year, would be ample proof of his love of order, and skill in arrangement.

But if any should seek for a higher test of his success as a farmer, the secret is disclosed in his untiring industry, in his working, where need was, with his own hands, and always where the labor was severe and ingenuity was required in its application, and in thus being the leader and instructor of his farm laborers.

If we may be permitted to dwell on this phase of his character, we will add that he never did anything "by halves;" and in the fact that he ever, in his private and official as well as in his farming life, carried out to the end whatever he undertook, we find confirmation of the wonderful simplicity and force of his mind. His directness and singleness of purpose were as manifest, as if he had based his life solely on the precept (not more wisely on the oracles from which it was taken.)

"To thine own self be true,
And it must follow, as the day the night,
Thou canst not then be false to any man."

Yes, so free was he from all that was covert in design, from all that savored of guile and suspicion, that it was hard for him to believe that these pests of our nature could lodge and fructify in human hearts, or to understand why they were not instantly eradicated by wholesome culture.

When we approach Mr. Foster's official relations to our Society, words fail us. They are lost in the emotions which his removal, from our pleasant circle of unsought honor and proffered labor, excite afresh. We have lost a companion in the work we render and the sacrifices we make, toward the elevation of agriculture, to the rank of an accepted science and honorable profession. Many of us have parted with a very dear and intimate personal friend, with whom in the many problems of life we took sweet counsel. We prize the memory of his promptness, frankness and courtesy in counsel and action; his readiness to redress or smooth a grievance, felt in reality or imagination, as sometimes happens in the contests for the awards and testimonials of our Society; above all, that sincere manifestation of interest in its welfare, that uniform devotion to its continued prosperity, that instinct of honor which spurned the most specious wrong and championed the feeblest right.

We surrender to the members of the Society the task which they

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can best perform, the embalming of his memory in their hearts. Our work of tracing, in outline, this memorial of his life and character is submitted in the consciousness that the life tints will be added by many loving hearts, and with no little misgiving that as his merits have been poorly scanned his place will be tardily filled.

In an age in which vast fortunes seemed to be gained by the throw of a die; when most of our youth, spurning the trodden paths of labor, are seen dangling after the car of fortune; when the farm is thrown up and the old homestead forsaken, and its inmates covet village lots, and its young men leave the plow for the counter; when, under an unprecedented demand on the fruits of labor and the products of industry to support our credit as a government and people, production in agriculture is lessened and consumption in the luxuries as well as necessaries of life increased; who are they, born in cities, lapped from infancy in ease and affluence, who will cast behind them all clogs on noble inspiration, tear themselves from luxury and the blandishments of frivolity and folly, resolve to stem the tide which is hurrying our country to bankruptcy and ruin, and devoting their energies to an increased production from deserted or impoverished farms, gladly spend their lives in the study and in the workshop of Nature? On whom of such shall fall the mantle of our departed friend?

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ADDRESS

BEFORE THE NEW YORK STATE AGRICULTURAL SOCIETY, AT THE TWENTY-NINTH ANNUAL FAIR, AT ELMIRA, 1869.

By George Buckland, Professor of Agriculture, University College, Toronto, and Secretary of the Board of Agriculture of Ontario.

Mr. President and Members of the New York State Agricultural Society:

Gentlemen.—I esteem very highly the honor you have done me, by inviting me to deliver the address usually given on the anniversary occasions of your extensive, instructive and world-renowned exhibitions. I have always been accustomed to regard your Society with feelings of respect and gratitude, as being the precursor of many similar institutions on this wide and fertile continent; and I shall esteem the present occasion of addressing the farmers, mechanics, and citizens generally, of the old Empire State, among the happiest of my life, if I can say anything that shall, in however humble a degree, tend to encourage you in prosecuting the important objects contemplated by the founders of this Society more than a quarter of a century ago.

Orators and poets of all ages and countries have extolled the importance of agriculture, and sung of the charms and beauties of rural life. As the first want of man is food, and the only supply being the produce of the soil, the cultivation of the earth and the keeping of flocks and herds must have been coeval with the first fixed forms of human society, and the history of this necessary art may be justly regarded as the history of civilization itself. Not only do we depend on the skill and industry of the husbandman for the staff of life, "our daily bread," but also, in a great measure, for the raw material, as it is termed, which the manufacturing and ornamental arts of an ever advancing civilization work up into the necessaries and adornments of social and domestic life.

If, therefore, agriculture be so ancient and indispensable, not only to the general well-being of society, but to the very physical existence of man, removed but a degree from the savage state, the question

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naturally arises in every reflective mind, acquainted with its general or particular history, how is it that this most valuable art has not kept pace with the other industries of life, but has generally been found lagging behind, and frequently exhibiting symptoms of a feeble and sickly existence? There have been laws and customs in most of the countries of the old world, affecting the acquisition, distribution and management of landed property, that have done much, and unhappily in some cases yet continue, to impede the progress of a national agriculture; causes from which we, of the new world, are in great measure, or altogether, free. But the question naturally occurs whether, under favorable circumstances, there is anything in the nature of agricultural pursuits, *per se*, that tends to render its improvement and progress comparatively slow? I think there is.

In the first place, in countries of the temperate zone, at least, it requires a whole year for the farmer to make a single experiment, and, as the art advances, much longer periods, as rotations of four, seven, or more years are involved, before safe conclusions can be drawn from well established data. If to this be added the differences of soil, even on the same farm, the variable character of the seasons, and the many substances now employed as manures, it will be at once apparent that agricultural experiments are, in their very nature, highly complicated, and the number that comes within the experience of the busiest and longest life, must be necessarily restricted. In most other industrial arts, experiments may be almost indefinitely multiplied within ordinary limits of time, and subjected to a series of rigid corrections, so that reliable results may, in most cases, be readily obtained.

Again, the isolated character of the farmer's life must necessarily tend, in some measure, to retard the progress of his art, as compared with those carried on in the populous centers of human industry. In cities and towns, merchants and manufacturers come in daily contact with one another; inquiry hence becomes stimulated, information rapidly and widely diffused, experiences compared, and whatever may occur to affect the interests of any particular branch of industry, those who pursue it can meet without delay, and take counsel in regard to their common welfare. Farmers, from the nature of their pursuits, even in this wonderful age of cheap and rapid inter-communication, are necessarily cut off more or less from each other, and can only come together at infrequent intervals. It is noteworthy to remark how comparatively rapid has been improvement in agriculture, both in the old world and the new, since the general introduction of the

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railway, which, with other agencies, has been a chief means of quickening the agricultural mind, not merely by cheapening transit, and in some instances creating new markets, but chiefly by enabling the tillers of the soil to extend the sphere of their observations, of witnessing and comparing different systems of culture, and of obtaining valuable information of a reliable character from each other's observations and different modes of practice. I can remember the time when large numbers of English farmers seldom went beyond the boundary of their own county. Some even hardly passed the limits of their own or adjoining parish. What a change has been effected since the introduction of the railway! Farmers may now be seen traveling hundreds of miles to an exhibition, or in company as members of a club, paying periodic visits to inspect the practices of distinguished individuals of their craft in different parts of the country. A little perambulating of this sort has a most salutary effect in enlarging the farmers' circle of observation, enabling him to gain new ideas, to break loose from traditional prejudices, and to improve his practice by adapting it to the new lights which science and enlarged experience throw across his path.

Among the causes that have retarded the progress of husbandry may be mentioned the absence of a healthy and efficient agricultural literature. It is true that a number of treatises on this ancient and indispensable art were written by distinguished men belonging to the two most cultivated nations of antiquity, the Greeks and the Romans, and in such of their works or fragments as have come down to us we find interspersed not a little that is excellent and practical, from which we might profit in the present day. These writings, however, and even those of a much later date, contain, as Lord Bacon said, "*no principles;*" that is, they are, notwithstanding the many valuable and practical directions which they contain, essentially empirical. Indeed, it could not possibly have been otherwise, as agriculture was incapable of being reduced to anything approaching the condition of a science till chemistry and physiology, at least, assumed a definite form, a result that may be said to be quite recent. Going back to the early part of the present century, when Sir Humphrey Davy delivered his celebrated lectures on agricultural chemistry to the Board of Agriculture in England, and to the report of Baron Liebig, on the same subject, to the British Association for the Advancement of Science, some thirty years ago, we discover the cause of the mighty impulse that has in these days been given to more earnest scientific research, and wider and deeper investigations, so as to put not only

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the laboratory, but also the printing press, into a more active and harmonious operation. In all civilized countries science, of late, has more or less been brought to bear on the practice of agriculture with beneficial results, and the reports and transactions of agricultural societies in different parts of the world, together with a legion of periodical journals in this great interest, unmistakably indicate the present healthy state of progress, the future limits of which it is quite impossible to define. I may further observe that America occupies a foremost place in agricultural literature, as the valuable reports and transactions of this and other Societies, with the documents that are annually issued by the Federal and State governments, amply testify. Your numerous weekly and monthly periodicals, embracing such pursuits, works mostly, I believe, of private enterprise, estimated by their price, quality and circulation, stand unquestionably ahead of any other similar publications in the world. And here I shall be only doing a simple act of justice by making a passing reference to the last report published by your Society. The "getting up," as it is technically termed; its numerous and beautifully executed illustrations; the scientific and practical papers on some of the most important and difficult subjects that come within the range of modern research, brought down to the present state of knowledge, would be an honor to any Society, older and wealthier than your own. Instead, then, of croaking and finding fault on account of the slow progress of our art, instances such as these should inspire us with glowing hopes for the future.

It has been remarked that, as a general rule, whatever is most valuable and enduring is of slow and progressive development. The globe we live on, at least its crust, appears to have been subjected to physical changes through untold and even unimagined periods of duration. Its vegetable productions; the trees of our own forests, for instance, some will endure for centuries ere they become finally resolved into the mineral and organic constituents of which they are composed. Our Christian civilization has a most interesting and instructive history to tell, its numerous vicissitudes, sometimes apparently stationary and even retrograding; at others marked by decided if not rapid progress; and yet it has taken nearly nineteen centuries to reach its present imperfect condition. So, again, as regards civil government. What time, talent, statesmanship and philanthropy have been expended in reducing to a practical form the best way of ruling mankind, so as to obtain the legitimate object of all sound legislation, "the greatest happiness of the greatest number." In

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these matters our knowledge has to be corrected and enlarged by time and experience; and, notwithstanding the progress, particularly of late, that has marked the history of many nations, who has the temerity to affirm of any one of them, that it has reached the *ne plus ultra* of perfection? So it may be that the slow advance of agriculture during the past centuries is in accordance with a principle of nature, of a much wider application than is generally perceived.

Whatever causes may have contributed to impede the onward march of agriculture, some more difficult to modify or remove than others, I have long felt a strong conviction that the most formidable obstacle to the general advancement of the art in all ages and countries has been, and unfortunately still is, the low estimation in which it is held, not only by communities, but also by the great mass of its followers themselves; by this I mean, the little acquisition of an intellectual character which has been regarded necessary to a farmer. I believe, and rejoice in the conviction, that a new era is commencing, or rather has already commenced in earnestness in several countries of the eastern hemisphere, and that to us here of the west, especially, a high and important trust has been committed, which, if faithfully executed, will be pregnant with untold blessings to all coming generations. To thoughtful minds the truth is beginning everywhere to be more or less distinctly recognized, that it is not every man can, by the old routine of mere muscular toil, be made a prosperous and improving farmer, but that a good general education in the first place, supplemented by special study and training, with the acquisition of sound business habits, are the essential elements of success. The fact is, that farming, intelligently pursued, is quite as much an affair of the mind as of the body. Indeed, muscular force, as is well known in all other matters, spends itself for naught when not directed by mental power; and most assuredly the practice of husbandry is no exception to this great, general law, and he who successfully labors to base the art of culture on the facts and principles of science, dissipates the darkness and uncertainties of empiricism, and becomes, in the highest sense, the improver and benefactor of his race. Let us look at this matter for a few minutes in a familiar manner. Let us ask ourselves the question, *What is agriculture?* and try to answer it as briefly and accurately as we can. Agriculture, it may be said, is the art of cultivating the soil for raising crops for the sustentation of man and animals. Now, who that reflects on what is involved in this short answer, can come to the conclusion

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that any man, provided he has powerful muscles, can make a farmer? The first thing that might strike the attention of a reflecting person, in the above definition, is the little word "*soil*;" a term expressing not a simple, but an extremely complicated substance, comprising a variety of materials, in different chemical and mechanical conditions. In traveling through any considerable area of country, you pass over a diversified surface, composed of different soils, from the disintegration and commingling of the various underlying rocks, differing in some instances very widely from each other in chemical composition, and mechanical and hygrometric properties. To acquire what may be termed only a practical knowledge of soils, a life of observation and farm-experience is required; and if we desire a minute and accurate acquaintance with particulars, on which much of success or loss in practice may depend, we are compelled to invoke the aid of the chemist and the geologist. The soil is a very complex thing, susceptible at the hands of man of great improvement, or, as is unhappily sometimes the case, of great deterioration; and no cultivator, however advanced his practice, or minute and extensive his observation, can obtain the maximum of profit and sustain the fertility of his land, without an acquaintance with those facts and laws, in relation thereto, which science has investigated and can alone explain.

Again: The soil, air, and water contain all the constituents which the farmer by means of *cultivation* elaborates into crops, and it is from the former alone that they obtain their mineral or inorganic portion. Now mark what is implied by this single word, *cultivation*. It involves, of course, the use of tools, implements and machines, the efficiency of which mainly depends on their mechanical adaptation to the various kinds of soils, as regards texture, density, and relation to warmth and moisture, and also to the habits and special requirements of different crops. In addressing an American audience, a people so distinguished for fertility of invention, I need only say, that between implements and machines constructed on the most approved principles of modern mechanics, and successful and profitable farming, there is an intimate and indissoluble connection. Take only that important and primitive symbol of husbandry, the plow, and without going back to Egypt, or the ancient Romans, compare, or rather contrast the implements that were in general use in Europe and on this continent less than fifty years ago, with those of the present time, and you perceive at once how much depends upon the employment of such implements as are in their form and construction in

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accordance with the laws and well-ascertained formulas of mechanical philosophy.

Further: The farmer cultivates the soil for the exclusive purpose, in the first instance, of raising crops; in other words, such vegetable productions as are best suited to soil, climate and markets. He ascends from the dead mineral earth to the living organized plant. A tiny seed is deposited in the earth, and under the influence of warmth and moisture germinates, assimilating materials from both the air and soil in the progress of growth, and after passing through a wonderful cycle of changes, reaches the condition of a perfect plant, ripens its seed, and thus secures the perpetuity of its species. Here he is brought directly in connection with the higher teachings of chemistry and vegetable physiology.

The farmer has yet a further and higher object: he raises plants for the sustentation of animals. This is the great and ultimate end of all agricultural operations. What a beautiful view is here opened by the ordinary routine of the farmer's daily life, of the intimate connection between what are termed the three great kingdoms of nature! The animal could not exist without the vegetable, which in its turn depends upon the mineral. Thus he ascends from the dead earth to the living plant, on which is nourished the living, moving and sentient animal! In the breeding, feeding and general management of his stock, the manner in which these operations are conducted may be regarded as an unerring index of the state and progress of agriculture; and much of the success of the practical man will depend on the extent and correctness of his knowledge of the principles of zoology and animal physiology.

Now, will it be maintained that agriculture is so simple a thing that any youth, however feeble his mind and sluggish his mental habits, can readily be made into a farmer, and that to engage in this pursuit, but little special information or training is needed, but simply a large expenditure of muscular force in accordance with a certain time-honored routine? This, unhappily, has been the prevalent feeling of the past, and it is still too much so at present; and I repeat, that it is to this low and fallacious estimate of the nature of agriculture and the qualifications of its pursuers, that much of its complained of slow progress is attributable. We must rouse ourselves so as to take higher and wider views of this great art, which, instead of being the simplest, is one of the most difficult and complex, as it is unquestionably the most valuable, of the various industries of this brief and busy life.

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I am aware that many fallacies have been committed by persons of sanguine temperament, earnestly desirous of correcting this low and degrading estimate of agricultural pursuits, by too strictly comparing its actual progress with that of some other arts. In order that comparisons may not be invidious, it is necessary they should be correct. It should be borne in mind that the marvelous progress made during the present century, in the cheapness and increased productions of textile manufactures, bleaching, dyeing, calico printing, etc., is in great measure due to the application of inorganic chemistry and improved machinery; the former science having attained to extraordinary development and exactitude during the past fifty years. The aid which chemistry renders the farmer, relates chiefly to the nutrition and growth of vegetable and animal life, termed organic, a department of the science having as yet but a very brief history, and the pursuit of which is beset with many and peculiar difficulties, and is subjected to rapid changes as, in the progress of discovery, past errors become corrected and new truths established. The manufacturer, by availing himself of the certain aids of a more simple and advanced department of chemistry, and operating exclusively on dead matter, under well-defined physical conditions of temperature, light, moisture, etc., is placed in a position almost absolutely to command whatever results may be desired. How different is it in these respects with the farmer, whose operations are exposed to and influenced by the uncertainty and variations of the weather, the changes in the nature of soils, often within very limited areas, and the complicated workings of that wonderful and mysterious force denominated *life!* In view, then, of these simple facts of the case, it would obviously be unreasonable, even under the most favorable conditions, to expect agriculture to advance with the rapid speed that has of late years characterized several of the manufacturing arts. The apparent anomaly, however, only strengthens and illustrates what I am desirous of impressing on this large and intelligent audience, the necessity and advantage of *connecting practice with science.* The principles of the latter are as applicable to the farm as they are to the manufactory, and the many and peculiar difficulties which at present beset the pursuits of farmers in relation to the higher teachings and applications of science, should induce them more earnestly than ever to devote their lives to inquiry, patient observation and unfaltering perseverance, welcoming with gratitude every ray of light which science may throw across their path, in the full assurance that, by degrees, present anomalies and

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perplexities of practice will be explained, and this noble art removed in great measure, if not entirely, out of the dark recesses of empiricism, into the cheering and health-inspiring light of a progressive science.

Having thus spoken of the connection between science and agriculture, and of the valuable aid the former has of late years rendered the latter, with a prospect of still greater benefits in time to come, I wish to guard myself against being understood as countenancing the erroneous and impracticable idea that an intelligent and improving farmer must in the *professional* sense of the term, be "a man of science." Such an opinion this audience need not to be told is quite utopian. The progress of the natural and experimental sciences of the present day is so marvelously great that it requires the energies of a life to keep pace with almost any one of them. If youths intended for farming, as a means of obtaining a livelihood, were placed in the laboratory to acquire and master the very delicate art of manipulation in the higher branches of organic analysis, with a view of becoming accomplished chemists, the time occupied in such studies and pursuits must preclude them from acquiring that practical knowledge and those business habits, apart from which farming must, commercially at least, prove a disastrous failure. What is really needed, and what is, I think, practicable, is so to instruct our youth in the principles of science, as to enable them to appreciate the results obtained by scientific men, and advantageously co-operate with them in effecting practical improvements. The amount of scientific knowledge which such a view assumes is no contemptible modicum, and would demand years of patient study and careful observation of an active business life to acquire. The great question is, how, in the present state of society and its educational appliances, a knowledge of scientific and practical agriculture can be best obtained?

It has often occurred to me that in this, as in most other matters, the best plan is to begin at the beginning, by imparting a knowledge to the pupils of common country schools of the foundation principles of good husbandry. The extent of the information that could thus be given would necessarily be restricted, but it need not on that account be otherwise than sound and practical. We have already several little text-books suited for such a purpose, and teachers without the expenditure of much time and money, might prepare themselves for the work, which would certainly tend to raise their professional status in the country, by increasing their respect and usefulness. The matter contained in *Johnston's Catechism of Agri-*

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cultural Chemistry and Geology, and *Stephens' Catechism of Practical Agriculture*, modified and adapted to American wants, would, if carefully gone through in a country school, impart a considerable amount of sound and useful instruction, and lay a firm foundation for whatever subsequent additions the pupils might acquire to erect thereon. It would be a pleasing and instructive object to have country schools provided with gardens for experimental and illustrative purposes. Such adjuncts would form valuable auxiliaries of teaching, and also tend to refine the taste and enlarge the minds of the pupils. A school house, instead of being, as is even yet too much the case in old and wealthy districts, bald and uninviting in appearance, if not positively repulsive, should be expressive and in harmony with its primary objects, both in its exterior and interior features, and a little ornamental planting and fencing would, as in the cases of churches and other buildings, public and private, very much improve the landscape of the country, and add a new charm to rural life.

Agricultural colleges have, of late years, attracted no inconsiderable amount of attention, both in Europe and America, and a number of experiments have been made with very varying degrees of success. The immense grants of the public lands made a few years ago by the federal government for the establishment of agricultural colleges, and the prompt action taken by many of the State Legislatures to reduce the noble project to practice, redound to the honor and intelligence of this great nation. An old and distinguished member of this Society has immortalized his name, and done imperishable honor to his country by the princely munificence which founded the Cornell University, in this State; an institution which recognizes the true dignity of human labor, both of the mind and of the hands, and strives in a natural and beneficent manner to combine both in harmonious relation. Every true friend of his country and race must earnestly desire that this and similar institutions may realize the aspirations of their founders and promoters, and impart untold blessings to posterity.

It would be impracticable to lay down, in all cases, absolute rules for teaching agriculture, theoretical or practical, in public institutions, as much must depend on the varying circumstances of each country or State. If elementary instruction were generally given in primary schools on the leading principles of this art, a desire, no doubt, would be increased, in many instances, for more extensive and minute information, which the higher order of colleges only could impart. When it is found impracticable to establish and sustain a pure and

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independent agricultural college the object might, to a great extent, be accomplished by incorporating an agricultural department with already existing educational institutions, possessing a staff of teachers in the various branches usually comprised in a university course of instruction. A farm of more or less extent for experimental and illustrative purposes would seem to be a necessary appendage, where the teaching of the class room might receive a practical exemplification in the field or the garden. And here I may observe that agriculture, or the other industrial arts, cannot be thoroughly learnt in colleges or schools however well adapted they may be for teaching their scientific principles; the farm and the workshop are the only places where a practical knowledge, constituting an accomplished workman, can be obtained. It is most desirable that youths, intended for agriculture as a pursuit, should be regularly trained to farm labor, and in all young countries especially, such a condition is a necessity. Work, both of the head and hands, constitutes the basis of every sound system of agricultural education. And, after all, perhaps, to make a thorough and accomplished agriculturist, one whose acquirements will enable him to extend the bounds of knowledge, and enable him to adapt himself to the varying circumstances and conditions of practical life, he must study in more than one school, and become familiar with more than one system of instruction. The facts and laws of science he can learn in the college, and observe their application to practice on the experimental grounds; but he will further require a wider circle of observation only to be acquired by travel, and thus make himself personally acquainted with the different systems of management pursued by distinguished cultivators and breeders in various localities or countries.

Among the most efficient means of advancing the agricultural and cognate arts, I feel no hesitation in placing societies, such as the one whose annual exhibition many thousands will have witnessed on these grounds during the present week. Happily, societies of this nature have been formed in most civilized countries, and their success, upon the whole, must be considered decidedly encouraging. Numbers, no doubt, attend on these occasions for mere holiday pleasure, and probably carry away but little information that will benefit either themselves or others. It is to be regretted that the great essential objects and functions of these shows are not more clearly and generally understood, and their teaching power more deeply and widely felt. To see and to observe are too frequently very different things. It is the facilities given to observation, comparing one thing

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with another, and the drawing of sound practical conclusions from a sufficient number of well observed facts, that give to occasions like this their principal means of usefulness. The management of these shows, as they increase in size and complexity, requires continued modification, and is yet susceptible in all instances of improvement. I observe that you have adopted the plan of entering articles some weeks previous to the holding of the show, a practice which we in Canada (Ontario) have pursued with much satisfaction for several years. Now, we have only to take a step or two further; so to limit the period for taking entries, and make it *absolute*, that sufficient time may be afforded for compiling a complete classified catalogue or catalogues, and providing in the show-yard and its buildings, "a place for everything, and have everything in its place." To this state of advancement most of the great national societies of Europe have already brought their exhibitions, and we on this side of the Atlantic would greatly consult the convenience and information of visitors, and materially enhance the interest and increase the usefulness of our exhibitions by following, as close and rapidly as circumstances admit, so good an example. The management of the Royal English Society's show, last year, at Leicester—the ease and harmony of its working—was to me a marvelous phenomenon. The grand secret of all this consists simply in the final closing of all entries in proper time to allow of the necessary arrangements for the placing of the articles in an orderly and systematic manner. Further: It has appeared to me that a longer time than is ordinarily given is required to bring fully out the teaching power of our exhibitions. Live stock probably could not be kept longer than it usually is, without incurring an amount of inconvenience, risk and expense that might discourage exhibitors; but, as regards mechanical, manufacturing and fine arts productions, and those of the farm and garden; that is, with the exception only of animals, the same reasons do not apply, or, at least, only in a very inferior degree; while the addition of only one or two days to the very contracted time usually allotted the public to observe these departments, would be both welcome and advantageous to all visitors. I have often thought that we go to enormous trouble and expense to get great crowds together for a day or two, in which it is always difficult, and sometimes impossible, for individuals desirous of obtaining information, to inspect the articles with any degree of care or comfort. The suggestion which I have ventured to make would, to a considerable extent, at least, rectify this serious defect.

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It has often occurred to me that there is a latent power of good in local agricultural societies that would be of great public benefit, if it were properly developed. I refer to the advantages that would follow the more frequent meeting of their members, for the consideration and discussion of subjects of a practical or scientific character. Members of the majority of township societies are commonly satisfied, I believe, with an annual fair, and meeting for the yearly transaction of business and election of officers. Exhibitions are very useful and excellent things, but they are not everything. An agricultural society should be, in the strict sense of the words, "*a mutual improvement society.*" This valuable object is, no doubt, largely obtained by bringing the results of industry before public attention, for inspection and competition. Such occasions awaken thought and interest, inspire men with higher aims, and more powerful motives to improvement Periodical meetings during the remainder of the year, especially the comparatively leisure season to farmers—the winter—would more effectually sustain and direct these impulses into fresh and practical channels. In this way the alleged sluggishness of the agricultural mind would be quickened, practical men would compare notes, and each would inspirit and improve the other by the mutual interchange of thought and the teachings of experience. Thus the foundations of agricultural knowledge would become broader and deeper, popular fallacies corrected, a pleasing social interest strengthened, a taste for reading and observation elicited, and the proffered aids of science with increased earnestness invoked. I am not aware to what extent "Farmers' Clubs," as they are termed, exist in this country; the one in the city of New York has for many years had a wide reputation; and I have felt much pleasure and derived considerable profit from reading the reports of meetings for discussion during the exhibition week of your Society, and also of its winter-meetings in Albany. If the smaller societies in the country would generally follow out this principle, a fresh and most salutary impulse would be given to agriculture, and young men engaged in the pursuit would take a greater and more rational interest in its advancement, and better prepare themselves for the discharge of the public duties of life. Referring to young men; how is it that so many abandon the rural pursuits of their fathers, and rush into cities and towns, to intensify the already severe competition generally existing in commerce and the professions?

There are doubtless several causes which conspire to produce this social phenomenon; the principal I believe to be, what has already

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been referred to: the false and low estimate commonly put upon farming as a pursuit. It is yet too much regarded as a monotonous life of drudgery, naturally inferior in social status to the more dazzling occupations of city life, and utterly powerless as a means of acquiring a fortune. Young men of ardent imaginations and undisciplined minds soon become dissatisfied with what to them is one dull and dreary round of duty. How little is done in many country homes, to make them attractive to the young, and often still less on the farm, to render its various seasonal operations a source of rational interest and agreeable information! Give to youth such an education and training as will enable them to compehend and appreciate the wonderful phenomena of their daily life, and they will soon feel convinced that agriculture is an intellectual, agreeable and dignified pursuit, alike favorable to health of body, and strength and purity of mind. Practical farming of course implies a certain amount of manual labor, but this, within proper bounds, is a blessing, rather than a curse. Everybody knows that physical exertion of some kind or other is an essential condition of bodily health; and the farmer has the pleasure and advantage of laboring in a salubrious atmosphere, under the blue vault of heaven, surrounded by the beauty and charms of country scenery. Besides, if the farmer has, at particular times, to work hard through many a long day, we must not suppose that city life is one of peculiar ease. It is, probably, on the whole, a harder life than that of the country. Men, as a rule, do not make fortunes in trade, or rise to eminence and opulence in the professions, without powerful and continuous exertions of the mind, and sometimes, too, of the body. Multitudes in every large city labor hard, day by day, for little more than a bare subsistence, enjoying but few intellectual resources, or the amenities of social life. In a country like yours, where class distinctions are not sharply drawn, and honest labor in any department of industry need not be ashamed to raise its head, what a pity it is to see the youth from the country, the strength and hope of the State, flocking into the cities to intensify, as I have already said, the competition that even now is, in many cases, overdone. As to the making of a fortune, if by this is meant the securing of a competence after an honest, industrious business life, agriculture holds out inducements generally, when intelligently pursued, equal at least to those of commerce or the professions. It may be a somewhat slower way of making money, and devoid of the few dazzling prizes belonging to the lottery of trade, but its gains, if smaller and slower, are in the long run surer. I have a strong misgiving that our modern systems of

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education, vastly improved and enlarged as they have been of late, are yet in some important things much wanting; and that they indispose our youth to enter with hearty good will on those particular pursuits which necessarily involve the performance of manual labor — pursuits, we should remember, that constitute the very foundation and frame-work of society. Now, this pernicious objection can only be removed by enlightening public opinion and reforming educational systems, so that youth will be taught, not merely in theory, but in practice also, to comprehend and appreciate the worth and dignity of labor, whether of the head or hands, or, what should always be the case, of both conjoined. I cannot regard our position as farmers to be hopeless, as the fact is truly encouraging that every improvement made in agricultural mechanics—and such improvements in this mechanical age are great and rapid — as this and similar exhibitions testify, necessarily tends to diminish the severity and monotony of manual labor. Plowing, for example, with our modern and improved implements, is quite a different thing from what it was with the heavy and ill-constructed ones of thirty or forty years ago; and the threshing, reaping and mowing machines, in the perfection to which they have already been brought, reduce human labor, as it were, to a minimum, and in great measure relieve the husbandman of some of the hitherto most laborious of his operations.

The agricultural world seems certainly, if not rapidly, adopting a new power in the cultivation of the soil, and for diminishing manual and animal labor, that will form a new and striking epoch in the history of the art. I refer to the application of steam to farm work. The steam plow has already obtained a firm footing in the British Islands, and several European countries, in Egypt and India, in Australia and New Zealand. From what I saw last year of its working both in England and Scotland, and the severe and extensive trials to which it was subjected at the royal show at Leicester, the few misgivings I might have had relative to its practical and extensive adaptation were certainly removed. Not only is steam culture cheaper than horse, but it can be made deeper and more thorough than it is possible to do by the ordinary methods. It has been said that the age of the plow, the old characteristic symbol of husbandry, is gradually drawing to a close, and that this ancient implement will be superseded by the cultivator or grubber. Without endorsing this opinion in its entirety, there is no doubt some reason in its favor. For many purposes, and in particular conditions of the soil, the action of the grubber is far more advantageous than that of the plow, as a more

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perfect disintegration and commingling of the whole mass is thereby affected; and there seems a growing tendency in an advancing agriculture to produce this thoroughly breaking up and mixing the soil in preference to the simply turning of it over, as is done in ordinary plowing. There is, besides, an increasing conviction among those that have adopted steam cultivation that better crops are thereby produced; and from the opportunities I have had for observation on this matter, I am constrained to agree with the conclusion. I could not help remarking last summer on the farms of the Messrs. Howard, of Bedford, the renowned agricultural implement makers, as also in other parts of England, that the growing crops appeared more luxuriant and promising where steam culture had been adopted, all other conditions, soil, manure, &c., being apparently equal, than when, sometimes in the same field, what was considered good horse-power cultivation had been practiced. The difference in favor of the former was explained by the facts, that steam power effects a deeper, more thorough and uniform moving and intermixing of the soil, without subjecting it to the tramping of horses, which in wet weather and on heavy land, every practical man knows is very detrimental. The steam plow has, as yet, been only introduced for experimental purposes, I believe, in this country. Various causes have combined hitherto to prevent its general introduction.

Notwithstanding, I feel it is a moral certainty that on this continent, particularly on the immense prairies of the great west, the steam plow will one day achieve its proudest triumphs. The richest soils, after the exhaustive cropping to which they are commonly subjected, will require deeper and more perfect cultivation in order to sustain their wonted fertility; and there can, I think, be little doubt that in, it may be, a few years, these improved modern appliances will renovate many of your already deteriorated soils, and impart a fresh impetus and give a new and much improved character to American agriculture.

In a new and extensive country, possessing various degrees of natural fertility, where the price of labor is high, and that of produce comparatively low, the farmer is strongly tempted to adopt a system of tillage that will surely, although, at first, almost imperceptibly, diminish the productive power of the soil. This gradual deterioration is sometimes allowed to proceed to such an extent that cultivation ceases to be profitable, and the land may be abandoned and revert back to its original wild condition. In an immense continent like this of North America, where there are yet many millions of acres of

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untouched virgin soil of great natural productiveness, it would be unreasonable to expect the adoption of systems of culture which have long been profitably practiced in the older, smaller and more populous countries of the eastern hemisphere. Still, it must be obvious, on a little reflection, that even in America some limit will have to be put to the operation of this principle of deterioration, or the period will be reached when farming will cease to be remunerative, or the land to yield sufficient food to meet the growing wants of a rapidly increasing population. The great problem to be solved by the American farmer is how best to sustain the equilibrium between waste and supply. Every crop he raises abstracts from the soil a certain amount of mineral ingredients, constituting the essential food of plants. If this waste be suffered to go on without repair, the ultimate result will surely be sooner or later reached, the exhaustion of the soil; or, in other words, a soil so weakened by over-cropping and non-manuring that its cultivation ceases to be profitable. Amidst the too general tendency of diminished productiveness, it is encouraging to be assured that, in most instances, exhaustion of the soil is *relative* rather than absolute. A farm *absolutely* exhausted, that is, the tillable soil deprived of all, or nearly all the ingredients necessary to feed healthy crops, would, in a country where land is plentiful and cheap, be dear as a gift, unless it possessed some intrinsic value arising from situation, or other local circumstances. It is commonly found that what is termed exhausted, or worn out land, is only in that condition a few inches deep, such soils having usually been cultivated in a shallow, and imperfect manner; and below the four or five inches to which the plow has penetrated, there is frequently locked up a considerable store of plant-food. In such cases deeper cultivation, and a more intimate mixing of the soil will sometimes, without extra appliances, restore its lost fertility. Cultivation, of course, does not create matter, but simply changes its mechanical and chemical condition. It frequently happens that soils considered infertile contain a sufficient amount of plant-food in a dormant state, and all that is required to bring it into a condition to enter into the circulation of growing crops is to admit freely air, warmth and moisture by means of deeper cultivation.

There are, however, too many instances of land being worn out by over-cropping, that deeper tillage *alone* will not be found sufficient, but extra substances must be applied to the soil before its lost productiveness can be restored, hence the necessity and value of what are termed manures. It is in this department of husbandry that modern

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chemistry has rendered the greatest service, not merely by analyzing the products yielded by the decomposition of plants, and therefore defining the nature and relative amounts of the various constituents of their food, but also by so treating a number of substances which otherwise would remain useless, or positively injurious, as to work them up into special manures adapted to the requirements of particular crops. In Europe the manufacture of artificial manures, as they are termed, has for some time assumed gigantic proportions; and it is encouraging to find that in several of the larger cities of this continent, similar manufactures have already made a successful commencement. Many English farmers annually expend as much money in purchasing artificial manures and cattle food, as the amounts of their respective rents. This, with a thorough and clean system of cultivation, will account for their high *average* produce; fifty or sixty bushels of wheat per acre being now grown on land which a quarter of a century ago only produced twenty-five or thirty. We sometimes read with feelings bordering on incredulity, of the enormously large crops raised under the system designated "*high farming;*" but there can be no doubt that in a country like England, an expenditure that appears to us enormous, if not utopian, is, when directed by sound judgment and experience, productive of a maximum profit. It has been said "that the soil is always grateful, but it will have something to be grateful for." Tenant-farmers in Britain may generally be said to have a working capital of from eight to ten pounds sterling per acre, the amount depending greatly on the system pursued. I was told last year, by an English tenant-farmer pursuing the mixed husbandry, that he had sixteen pounds an acre, and he felt confident that his business could be made more profitable by increasing his capital. Yet, even in England, one constantly hears the complaint that too little capital is invested in the management of land, and practical men generally endorse the sentiment. Certainly on this side the Atlantic our farming capital generally is miserably deficient, and farmers, as a rule, could make no investment of their savings so safe and profitable, as to use them for the further development of their own freeholds.

We must be careful, however, in drawing practical conclusions from analogical reasoning founded on the conditions and practices of British agriculture, as applying to our own, under different circumstances. What might pay well to do in England, might, if attempted in the same manner, entail an actual loss in this country. True, the *principles* of agriculture are the same all over the world, but i'

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requires both caution and local experience in properly modifying their application to meet the varying conditions of soil, climate, and markets. In old populous countries, where land is high in price and in constant demand, it may pay well to incur a very heavy expenditure in restoring absolutely exhausted farms; but in America, where land is plentiful and cheap, and the appliances for restoring a lost fertility, scarce and dear, the operation would likely prove a heavy loss, the market value of the improvements falling below their cost.

There is an old adage of a very wide application, which comprises the case under consideration: "An ounce of prevention is worth a pound of cure." It is certainly much cheaper, and in some respects even easier, to keep the soil in good heart when we have it in that condition than to suffer its productiveness to decline, and restore it afterward. This, no doubt, would be the practical sentiment of farmers generally if they took a broad and prospective view of the case, and felt a *permanent* interest in the land. But it has been too much the fashion to look too exclusively for *immediate* results and to adopt a system of management which, while it enriched the fathers, must inevitably impoverish the sons. The vast fertile and unoccupied areas of the west, yielding for a while bountiful crops with little care and expenditure, have, doubtless, tended to retard the healthy development of agriculture in the eastern and central States, and this cause will continue to be felt more or less till that immense region, of the extent and resources of which we are beginning now to form some definite conception, becomes peopled with an industrious and thriving population. When that period shall have arrived, and the progress is assuming immense rapidity and proportions, the motives to exhaust land here, remove and commence a similar operation on new and fertile soils there, will be reduced to a minimum, and American agriculture, as a whole, will assume a high and homogeneous character, ultimately working out for itself a position, whether for magnitude or excellence, that will be unsurpassed by any portion of the habitable world.

From a pretty intimate acquaintance which I may be supposed to have of Canadian agriculture, which in its leading features must resemble more or less that of these northern States, there are a few important points on which I am accustomed to insist, and which may not be devoid of some interest and relevancy on this side of the lines. I say to our people, *cultivate less* and *cultivate better*. It is the slovenly and superficial culture, so widely practiced, that keeps the average of our crops so low. Really, when we consider how little

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the soil receives, and how much is taken from it, the wonder is, not that it produces so little per acre, but that it grows so much. I feel morally certain that much of the land in the old world, if it received no better treatment than we are accustomed to give ours, would be inferior in production even to our own. Cultivating less does not necessarily imply growing less. Every practical man knows full well that one acre of land properly prepared for a given crop will produce as much as double the quantity imperfectly and negligently prepared. If, therefore, by adopting an improved system of husbandry suited to our specific wants we can produce as much grain, roots, etc., from a less surface, the remainder can be made profitable in another way; that is, in pasture, whereby we give the land "rest," and enable it to sustain a larger number of live stock. Between "corn and horn," to use an old phrase, there is an intimate connection and a mutual dependence. By keeping more stock of improved and suitable breeds we get larger and quicker money returns, make more manure, which is the farmer's sheet anchor, after he has diminished the often great natural fertility of his virgin soil.

I can see no other method, alike practicable and profitable, of restoring and sustaining the fertility of the soil. As the population of the country increases, particularly in the great centres of manufacturing and commercial industry, the demand for food of improved quality proportionately increases. Prices advance for grain and meat, and a fresh impetus is given to both departments. The more cattle and sheep the farmer keeps, the more grain he grows, as animals are the manufacturers of manure, that is, the food of crops. And here let us pause a moment, and reflect on the lamentable waste of productive power, arising from the most culpable neglect of the precious articles of farm yard manure. I don't exactly know how this matter stands with you on this side the boundary, but I never meet a body of our farmers without reminding them of the fact, that from unnecessary exposure, barn-yard manure is frequently reduced in value forty or fifty per cent; a loss that might generally be prevented by the exercise of a little forethought and care, involving no heavy pecuniary expenditure. In old settled sections such waste is unpardonable, and would be considered inhuman, if plants were regarded as possessing a sensitive organization. I can remember when this kind of manure was similarly neglected in the more backward districts of England and felt puzzled to determine which inflicted the greater evil on his country, the tenant-farmer who neglected his manure to develop his crops, or the game-preserving landlord, who caused them

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to be eaten up. The possession of land is a sacred trust, and society sanctions by law the right of private ownership on the understood condition that it be used in such a manner as to confer the greatest benefit, not merely on the individual owner or occupier, but on the community at large.

Among the most efficient means of agricultural improvement in the temperate zone, at least, is draining, an artifice that has been attended by the most beneficial results, particularly on wet and heavy soils. I will say a few words both of caution and encouragement on this subject. I have found newly arrived settlers in the newer parts of Canada, who had been accustomed to the use of draining tools, quite cast down in spirits, because they found themselves unable to carry out in practice the refined, elaborate, and expensive systems of draining to which they had been accustomed in the parent country. The difficulty in some instances of getting a sufficient outfall, and no draining tools or pipes being accessible, the operation was looked upon with feelings bordering on despair. I have spoken words of encouragement to such people, and shown them how they might make a commencement, at least, with success. In a new country especially, we must be guided in the character and extent of our operations by the main physical conditions of the surface; in other words, aid and improve nature's drainage. The clearing out of streams and creeks where they are obstructed by mud, fallen trees, and aquatic plants, is the first lesson to learn in practical draining. In this way an outfall can be generally obtained; but in very level districts, to accomplish this primary and essential object, the co-operation of several owners of land, through considerable distances, is sometimes necessary. Few can fully understand, apart from personal experience or observation, what an advantage it is to improve the natural water channels of a wet and level district. This preliminary being accomplished, the making of open or covered drains, as circumstances require, may be advantageously proceeded with. In the older cultivated districts of this country the more thorough and refined British systems of draining may be profitably followed, subjected to such modifications as differences in soil and climate naturally suggest. In a new country, however, draining must be, as a rule, differently commenced and executed, to what can be done in such as are older and wealthier. A ditch dug out as narrow at the bottom as the tool will allow, and partly filled with old rails or the boughs of trees, closely trodden down with a portion of the moved earth, will often answer an excellent purpose for several

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years. I observed, in England, last summer, a few drains in a field, two or three of. which had not wholly lost their functions, which I assisted in making when a boy, near half a century ago. The land is in permanent pasture, exceedingly tenacious, the drains were dug three feet deep (considered in those days "deep draining"), and the width gradually diminishing to about two inches at the bottom, in which was placed heath (héather) and the soil returned thereon, closely tramped down. The durability of such draining in clay soils, when carefully executed, and with which cultivation or wild animals do not interfere, is almost incredible. I mention these facts to encourage settlers in new districts to commence and persevere in the prosecution of such an efficient method of agricultural and sanitary improvement. The ditching plow, which has recently received important structural modifications, promises to become a very valuable implement in cheapening and extending draining processes. Before, however, dismissing this subject it is important to observe that the cheap system of draining (if what has been suggested can be so designated) is intended simply as introductory and provisional, as the best suited to the wants and circumstances of new settlers. There is no other agricultural operation that calls for the exercise of more judgment and care; and when means and appliances admit, no reasonable amount of expense should be spared in making the work as effective and permanent as possible.

I cannot conclude without again very briefly adverting to the immense progress made of late years by the exhibitions of this Society, and the improvements in agriculture and other industrial arts that must have resulted therefrom. From a humble commencement, not much more, I believe, than a quarter of a century ago, the course of this Society has been constantly onward, and its influence for good has been widely felt, not only in this and neighboring States, but throughout the Union and the Dominion of Canada. Indeed its fame has extended to every country of the civilized world. Its contributions to our common agricultural literature, the researches it has instituted into the nature and treatment of new and mysterious forms of disease of a most malignant character among the domesticated animals, and the thorough, systematic trials of farm implements and machines which it has on several public occasions made, impart to your Society a very high character and usefulness.

What a magnificent theatre does this great country present for the working out of the enlightenment, freedom and happiness of our common humanity? Extending east and west, from one ocean to

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another, and from the great lakes in the north to the gulf of Mexico in the south, comprising almost every climate, traversed by rivers of unrivaled magnitude, and richly endowed by nature with the means of agricultural, manufacturing and mineral wealth, it offers homes of plenty and comfort to the many thousands of the sons of toil who annually land upon its shores. I well remember, now more than half a century ago, a mechanic with his family emigrating from my little picturesque native village in the south of England, to the western portion of the State of Illinois, which, at that day, was regarded as the "far west." It took him more time and trouble to get from New York to his destination than the whole ocean voyage, which, at that period, was a much more formidable undertaking than it is now. How stupendous the changes in the means of locomotion, as in many other things since then, supplied by the steamboat and the railroad, the latter now connecting the Atlantic with the Pacific! These are truly marvelous changes occurring within living memory, and their benefits, with yet still further developments, will be transmitted from sire to son, through all future generations.

It is now upwards of twenty years since I first had the pleasure of attending the New York State Agricultural show, and I have observed with much gratification and benefit the astonishing progress you have made. Many of the earlier members of this Society, who took a prominent part in its management, among whom I had the honor of including several esteemed personal friends, have been removed from this earthly scene. And I cannot allow the present opportunity to pass, without expressing my deepest sympathy with the members of this Society, for the recent loss of its late venerable, respected, and most efficient Secretary. Col. Johnson was no ordinary man, and he was known and esteemed far beyond the Society, which he so long and honorably served. He certainly had a *British*, if not a European reputation, and we, over in Canada, were accustomed to look upon him as one of ourselves. In common with you, we mourn his loss; many of his acts of kindly and courteous attention will be long and gratefully remembered by not a few of the members of our "Provincial Association;" and now, that so good and true a man, full of years and honors, has been taken from us by the relentless hand of death, all I will further say is, what I am sure will honestly express the most sacred feelings of all your hearts: "*Requiescat in pace.*"

Only another word, and I have done. We meet on this occasion to promote the arts of peace and good will, the wealth, intelligence and

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happiness of Nations. As a British Canadian, I wish to express to you, and through you to the citizens of the United States generally, the cordial feeling of my people on the other side of the lakes, not only towards this Society, but for the peace and prosperity of your common country. We live, it is true, under different forms of government, but we speak a common language, and are proud of a common ancestry; and in fact we have so much in common that we regard as good and permanent, as will, I most devoutly trust, under the guidance and blessing of Divine Providence, lead to earnest and harmonious action in promoting the material development of our respective soils, and the peace, liberty, and happiness of the toiling millions of this vast continent.

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IMPROVED CHESHIRE SOW, "LADY MOODY."—The property of CLARK & GREEN, Belleville, N. Y. Winner of the first prize at the New York State Agricultural Society's Fair, at Rochester, in 1868; also, of the first prize in her class, and, with "Ben Butler" and five of their pigs, of the PORK PACKERS' PRIZE of $500, at the great St. Louis Fair of 1870.

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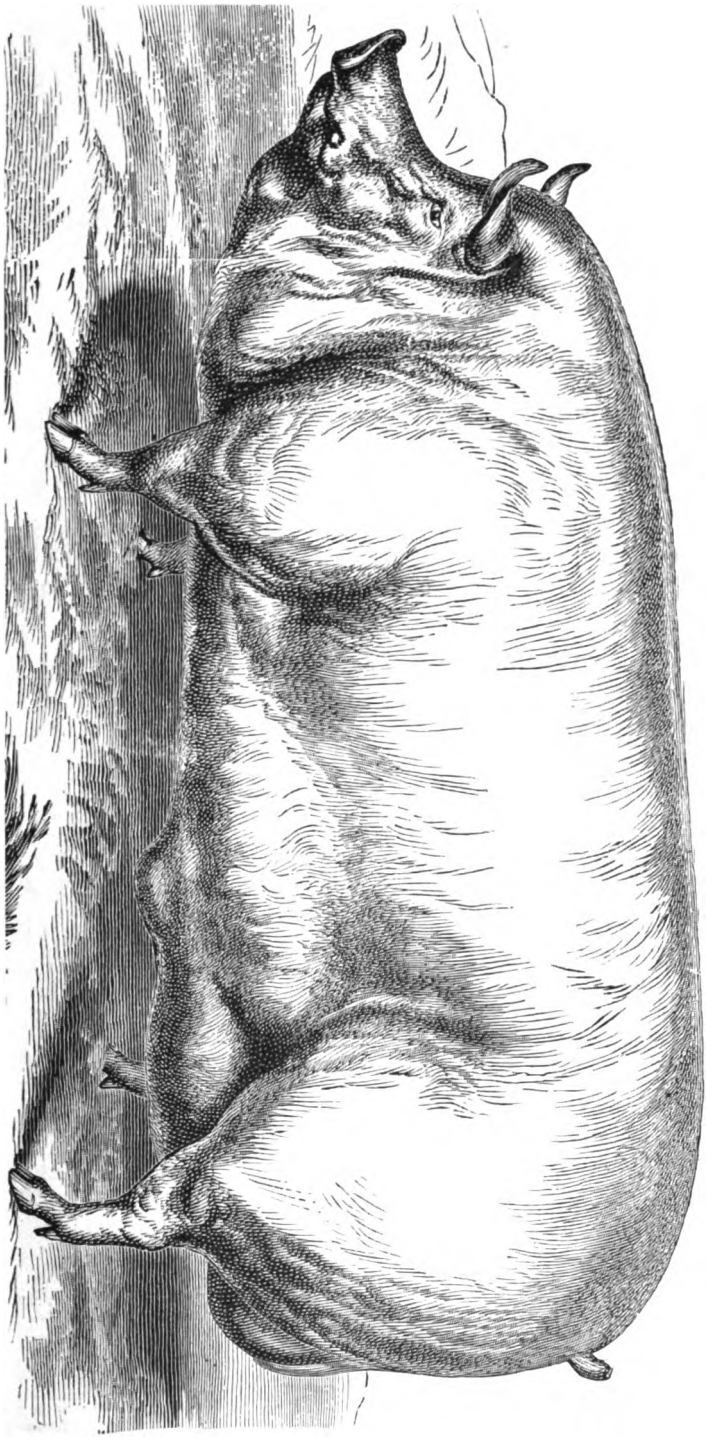

IMPROVED CHESHIRE BOAR, "BEN BUTLER."—The property of CLARK & GREEN, Belleville, N. Y. Winner of first prize at the Fair of the New York State Agricultural Society, at Buffalo, in 1867; also, with "Lady Moody" and five of their pigs, of the PORK PACKERS' PRIZE of $500, at the great St. Louis Fair of 1870.

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AWARD OF PREMIUMS.

TWENTY-NINTH ANNUAL EXHIBITION, HELD AT ELMIRA, SEPT. 14, 15, 16, 17, 1869.

CLASS I.—CATTLE.

No. 1. SHORT HORNS.—SHORT HORN HERD PRIZE.

E. Cornell, Ithaca, N. Y. ..... Large gold medal.

Bull, "Locomotive;"

Red, bred by exhibitor, calved May 22, 1868; by St. Valentine, 4348½; dam Lucinda, by Young Renick, 4524.

Cow "Princess 16th;"

Roan, bred by exhibitor, calved February 1, 1865; by St. Valentine, 4348½; dam Princess 12th, by Orion, 1964.

Cow, "Kirkleavington 12th;"

Roan, bred by exhibitor, calved April 29, 1865; by 3d Lord Oxford (22200); dam Kirkleavington 11th, by Delhi (15865).

Cow "Lucia;"

Roan, bred by exhibitor, calved January 19, 1866; by 3d Lord Oxford (22200); dam Lucinda, by Young Renick, 4524.

Heifer, "Lucy Curd;"

Red and white, bred by exhibitor, calved November 28, 1866; by Kirkleavington, 5860; dam Lucy Ann, by Cunningham (12671).

Heifer, Fidget 8th;"

Roan, bred by exhibitor, calved October 7, 1867; by St. Valentine, 4348½; dam Fidget 6th, by 3d Lord Oxford (22200).

Heifer, "Kirkleavington 13th;"

Roan, bred by exhibitor, calved November 9, 1867; by St. Valentine, 4348½; dam Kirkleavington 11th, by Delhi (15865).

Heifer, "Lucy Ann 12th;"

Red, bred by exhibitor, calved December 25, 1867; by St. Valentine, 4348½; dam Lucy Ann, by Cunningham (12671).

SHORT HORNS—BULLS.

First prize bull, 3 years old and over, William Blanshard, Penn Yan, N. Y., "Frederick," 5655; red roan, bred by exhibitor, calved April 1, 1865; by Clifton, 5450; dam Lily 3d, by Altorf, 2494, &c. $25

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Second, Ira Young, Jamestown, N. Y., "Favorite 3d;" red, bred by exhibitor, calved April 20, 1864; by Favorite 2d; dam Sally 2d, by Harold..... $15

Third, V. W. Mason, Canastota, Madison county, N. Y., "Seward" 6174; roan, bred by George Butts, Manlius, N. Y., calved August 25, 1864; by Apricot's Gloster, 2500; dam Seraph, by Duke of Manlius, 2773 5

First prize bull, 2 years old, George Butts, Manlius, N. Y., "Treble Gloster;" red, bred by exhibitor, calved March 31, 1867; by Apricot's Gloster, 2500; dam Spring Beauty, by Apricot's Gloster, 2500; gr. d. Silkie, by same bull.. 25

Second, James W. Wadsworth, Geneseo, Livingston county, N. Y., "Duke of Houston;" red, with some white, bred by James Hall, Paris, Bourbon county, Ky., calved March 15, 1867; by Dick Taylor, 5508; dam Flora 4th, by Princeton, 4285, gr. d. Flora 2d, by Renick, 903 15

First prize bull, 1 year old, E. Cornell, Ithaca, N. Y., "Locomotive;" red, bred by exhibitor, calved May 22, 1868; by St. Valentine, 4348½; dam Lucinda, by Young Renick, 4524..... 20

Second, C. K. Ward, LeRoy, Genesee county, N. Y., "Baron of Geneva;" red, bred by James O. Sheldon, calved October 14, 1867; by 2d Duke of Geneva, 5562; dam Constance 2d, by Duke of Airdrie (12730)..... 10

Third, J. J. Gallup, LeRoy, Genesee county, N. Y., "Ulysses;" roan, bred by exhibitor, calved March 29, 1868; by Astute, 6419; dam Governess 6th, by Duke of Orleans, 3877..... 5

First prize bull calf, E. Cornell, Ithaca, N. Y., "Baron Booth;" roan, bred by exhibitor, calved October 10, 1868; by Crobar, 6581; dam Maria Booth, by Duke of Oxford, 2780 10

Second, E. Cornell, Ithaca, N. Y., "Royalist;" red, bred by exhibitor, calved March 10, 1869; by Beau of Oxford, 4568; dam Rosamond, by Fordham Duke of Oxford, 2863 5

SHORT HORNS—COWS.

First prize cow, over 3 years old, E. Cornell, Ithaca, N. Y., "Kirkleavington 12th:" roan, bred by exhibitor, calved April 29, 1865; by 3d Lord Oxford (22200); dam Kirkleavington 11th, by Delhi (15865) 20

Second, E. Cornell, Ithaca, N. Y., "Lucia;" roan, bred by exhibitor, calved January 19, 1866; by 3d Lord Oxford (22200); dam Lucinda, by Young Renick, 4524..... 15

Third, George Butts, Manlius, N. Y., "Spring Beauty;" red, bred by exhibitor, calved April 6, 1864; by Apricot's Gloster, 2500; dam Silkie, by Apricot's Gloster, 2500, gr. d. Sally Randolph, by Lord Ducie, 662 5

First prize heifer, 2 years old, E. Cornell, Ithaca, N. Y., "Lucy Curd;" red and white, bred by exhibitor, calved November 28, 1866; by Kirkleavington, 5860; dam Lucy Ann, by Cunningham (12671)..... 20

Second, E. Cornell, Ithaca, N. Y., "Lucy Conklin;" roan, bred by exhibitor, calved January 10, 1867; by Kirkleavington, 5860; dam Lucinda, by Young Renick, 4524 15

First prize heifer, 1 year old, George Butts, Manlius, N. Y., "Strawberry;" red, bred by exhibitor, calved March 4, 1868; by Oscar, 6016; dam Spring Beauty, by Apricot's Gloster, 2500, &c..... 15

Second, E. Cornell, Ithaca, N. Y., "Lucy Ann 12th;" red, bred by exhibitor, calved December 25, 1867; by St. Valentine, 4348½; dam Lucy Ann, by Cunningham (12671)..... 10

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Third, E. Cornell, Ithaca, N. Y., "Fidget 8th;" roan, bred by exhibitor, calved October 7, 1867; by St. Valentine, 4348½, dam Fidget 6th, by 3d Lord Oxford, $5

First prize heifer calf, George Butts, Manlius, N. Y., "Olive;" red, bred by exhibitor, calved March 15, 1869; by Treble Gloster, 7321, dam Orphan, by Apricot's Gloster, 2500, gr. d. Olinda, by Echo of Oxford, 1500..... 10

Second, E. Cornell, Ithaca, N. Y., "Roselle;" roan, bred by exhibitor, calved November 20, 1868; by Crobar, 6581, dam Rosalind, by Duke of Oxford, 2780 5

Third, George Butts, Manlius, N. Y., "Souvenir;" red, bred by exhibitor, calved May 3, 1869; by Treble Gloster, 7321, dam Spring Beauty, by Apricot's Gloster, &c.....

An excellent class, as a whole. In several instances animals of rare merit were exhibited.

DAVID CHRISTIE, Canada.
THOMAS BELL, Eatontown, N. J.

No 2. DEVONS—DEVON HERD PRIZE.

Walter Cole, Batavia, N. Y.....Large gold medal.

Bull, "Helena's Huron 5th;"

Red, bred by exhibitor, calved April 9, 1868; by Queen Anne's Huron, 320; dam Helena 23d, 520, by Omar Pacha (513).

Cow, "Helena 28th;"

Red, bred by C. S. Wainwright, calved July 4, 1861; by Omar Pacha (513); dam Helena 5th (1391), by May Boy (71).

Cow, "Helena 31st;"

Red, bred by C. S. Wainwright, calved March 24, 1864; by Comet (162); dam Helena 17th, 518, by Hiawatha (432).

Cow, "Helena 32d;"

Red, bred by C. S Wainwright, calved March 31, 1864; by Comet (162); dam Helena 7th (1393), by May Boy (71).

Cow, "Helena 33d;"

Red, bred by C. S. Wainwright, calved May 7, 1865; by Comet (162); dam Helena 20th, by Hiawatha (432).

Heifer, "Cole's Helena 3d;"

Red, bred by C. S. Wainwright, calved May 17, 1868; by Iroquois; dam Helena 33d, by Comet (162).

DEVONS—BULLS.

First prize bull, over three years old, L. F. Palmer, Ithaca, N. Y., "General;" red, bred by Louis Palmer, Ithaca, calved March, 1864; by Colonel; dam Nelly 2d, by Major..... $25

First prize bull, two years old, W. E. Arnold, Otego, N. Y., "Young Washington;" red, bred by exhibitor, calved May 30, 1867; by General Grant; dam Daisy, by Young Exeter, 765..... 20

Second, Walter Cole, Batavia, N. Y., "Helena's Huron 5th;" red, bred by exhibitor, calved April 9, 1868; by Queen Anne's Huron, 320; dam Helena 23d, 520, by Omar Pasha (513)..... 10

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First prize bull calf, Walter Cole, Batavia, N. Y., "Helena's Puritan;" red, bred by exhibitor, calved September 26, 1868; by Queen Anne's Huron, 320; dam Helena 16th, 148, by Omar Pasha (513)..... $10

Bull calf, Walter Cole, Batavia, N. Y., "Oregon;" red, bred by exhibitor, calved June 29, 1869; by Queen Anne's Huron, 320; dam Helena 33d, by Comet (162) .....Commended.

DEVONS—COWS.

First prize cow, over 3 years old, Walter Cole, Batavia, N. Y., "Helena 28th;" red, bred by C. S. Wainwright, calved July 4, 1861; by Omar Pasha (513); dam Helena 5th (1391), by May Boy (71)..... 20

Second, Walter Cole, Batavia, N. Y., "Helena 33d;" red, bred by C. S. Wainwright, calved May 7, 1865; by Comet (162); dam Helena 20th, by Hiawatha (432) 15

Third, W. E. Arnold, Otego, N. Y., "Princess Beatrice;" red, bred by H. M. the Queen of England, in 1863; imported in 1865, by R. W. Cameron... 5

First prize heifer, 2 years old, Walter Cole, Batavia, N. Y., "Wanda 2d;" red, bred by exhibitor, calved January 19, 1867; by Queen Anne's Huron, 320; dam Lovely 18th, 593; by Young Exeter (765)..... 20

Second, W. E. Arnold, Otego, N. Y., "Princess Beatrice 2d;" red, bred by R. W. Cameron, calved December 16, 1866; by imported Prince of Wales; dam Princess Beatrice, imported 15

First prize heifer, 1 year old, Walter Cole, Batavia, N. Y., "Cole's Helena 3d;" red, bred by C. S. Wainwright, calved May 17, 1868; by Iroquois; dam Helena 33d, by Comet (162)..... ... 15

Second, W. E. Arnold, Otego, N. Y., "Princess Beatrice 3d;" red, bred by R. W. Cameron, calved ——, 1867; by imported Prince of Wales; dam Princess Beatrice 10

Third, W. E. Arnold, Otego, N. Y., "Daisy 2d;" red, bred by exhibitor, calved June 15, 1868; by General Grant; dam Daisy, by Young Exeter (765) 5

First prize heifer calf, W. E. Arnold, Otego, N. Y., "Daisy 3d;" red, bred by exhibitor, calved May 28, 1869; by General Grant; dam Daisy, by Young Exeter 10

Second, Walter Cole, Batavia, N. Y., "Cole's Helena 8th;" red, bred by exhibitor, calved July 7, 1869; by Queen Anne's Huron, 320; dam Helena 31st, 523, by Comet (162)..... 5

B. H. ANDREWS, Waterbury, Conn.,
Committee.

No. 4. AYRSHIRES—AYRSHIRE HERD PRIZE.

Walcott & Campbell, New York Mills, Oneida county, N. Y .....Large Gold Medal.

Bull, "Bruce;"

Brown, bred by exhibitor, calved March 20th, 1868; by Tarbolton, 372; dam Helen Douglas, by Roger, g. d. Lady Douglas.

Cow, "Helen Douglas;"

Red and white, bred by John Marshall, Scotland, calved April 30, 1861; by Roger; dam Lady Douglas, g. d. Beauty.

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Cow, "Maud;"

Red and white, bred by Brodie & Campbell, calved September, 1863; by Rob Roy, 325; dam May Flower, by Kilburn, 229, g. d. Red Rose.

Cow, "Jessie;"

Red and white, bred by exhibitors, calved April 9, 1866; by Baldy, 90; dam Bonny Jean, by Dr. Hornbook, 149, g. d. Handsome Nell, by Georgia, 428.

Heifer, "Cannie;"

Red and white, bred by exhibitors, calved February 18, 1867; by Tarbolton, 372; dam Challenge 4th, by Robert Bruce, 314, gr. d. Challenge, imported.

Heifer, "Lily Dale;"

Brown and white, bred by exhibitors, calved April 28, 1868; by Tarbolton, 372; dam White Lily.

Heifer, "Flossie;"

Brown and white, bred by exhibitors, calved May 1, 1868; by Tarbolton, 372; dam Elspie, by John Gilpin, 222, gr. d. Ayrshire Lass.

AYRSHIRES—BULLS.

First prize bull, over 3 years old, Brodie & Son, Rural Hill, Jefferson county, N. Y., "John Gilpin, 222;" brown and white, imported by Brodie & Campbell, calved April 7, 1863 ..... $25

Second, S. D. Hungerford, Adams, N. Y., "Abraham Lincoln;" red and white, bred by George Morton, Canada, calved April 25, 1862; by Dundee 7th; dam Sweety, by Rob Roy, imported, gr. d. Young Quebec..... 15

Third, Robert Brodie, Smithville, Jefferson county, N. Y., "Robert Bruce;" red and white, bred by James Brodie, calved April 28, 1866; by General Grant; dam Red Rose, by Rob Roy, imported, gr. d. Bonny Jean, by Kilburn, 229..... 5

Second prize bull, two years old, S. D. Hungerford, Adams, N. Y., "Hughie;" red and white, bred by George Morton, Canada, calved June 14, 1867; by Abraham Lincoln; dam thorough-bred cow, owned by George Morton.... 25

First prize bull, 1 year old, Walcott & Campbell, New York Mills, Oneida county, N. Y., "Bruce;" brown, bred by exhibitors, calved March 20, 1868; by Tarbolton, 372; dam Helen Douglas, by Roger, g. d. Lady Douglas..... 20

Third, S. D. Hungerford, Adams, N. Y., "Tommy;" red and white, bred by exhibitor, calved October 24, 1867; by Cashier; dam Libbie, by Ayrshire Chief, gr. d. Bessie 2d..... 5

First prize bull calf, S. D. Hungerford, Adams, N. Y., "Gilpin;" red and white, bred by exhibitor, calved January 1, 1869; by John Gilpin, 222, imported; dam Kate, by Ayrshire Chief, gr. d. Challenge 5th..... 10

Second, E. C. Holden, McGrawville, N. Y., "Governor 8th;" red, white and brown, bred by exhibitor, calved April 14, 1869; by Governor 6th; dam Jenny Lind 5th, by Governor 4th 5

AYRSHIRES—COWS.

First prize cow, over 3 years old, Walcott & Campbell, New York Mills, N. Y., "Maud;" red and white, bred by Brodie & Campbell, calved September, 1863; by Rob Roy, 325; dam May Flower, by Kilburn, 229, g. d. Red Rose..... 20

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Second, Walcott & Campbell, New York Mills, N. Y., "Helen Douglas;" red and white, bred by John Marshall, Scotland, calved April 30, 1861; by Roger; dam Lady Douglas; g. d. Beauty $10

Third, Walcott & Campbell, New York Mills, N. Y., "Jessie;" red and white, bred by exhibitors, calved April 9, 1866; by Baldy, 90; dam Bonny Jean, Dr. Hornbook, 149; g. d. Handsome Nell, by Georgia, 423..... 5

First prize heifer, 2 years old, Walcott & Campbell, New York Mills, N. Y., "Afton;" red and white, bred by exhibitors, calved June 16, 1867; by Baldy 90; dam Handsome Nell..... 20

Second, S. D. Hungerford, Adams, N. Y., "Hattie;" red and white, bred by exhibitor, calved January 17, 1867; by Cashier; dam Challenge 5th, by Tiger..... 15

Third, Walcott & Campbell, New York Mills, N. Y., "Cannie;" red and white, bred by exhibitors, calved February 18, 1867; by Tarbolton 372; dam Challenge 4th, by Robert Bruce 314, gr. d. Challenge, imported..... 5

First prize heifer, 1 year old, Walcott & Campbell, New York Mills, N. Y., "Flossie;" brown and white, bred by exhibitors, calved May 1, 1868; by Tarbolton 372; dam Elspie, by John Gilpin,222..... 15

Second, Brodie & Son, Rural Hill, N. Y., "Heather Bell;" red and white, bred by James Brodie, calved April 1, 1868; by John Gilpin,222; dam Jenny Lind,486..... 10

Third, S. D. Hungerford, Adams, N. Y., "Jessie;" red and white, bred by exhibitor, calved July 5, 1868; by Cashier; dam Bessie 2d, by Tiger..... 5

First prize heifer calf, S. D. Hungerford, Adams, N. Y., "Bessie 6th;" red and white, bred by exhibitor, calved August 1, 1869; by General Patrick; dam Anna, by Cashier..... 10

Second, S. D. Hungerford, Adams, N. Y., "Mary Helen;" red and white, bred by exhibitor, calved July 16, 1869; by General Patrick; dam Bessie 2d, by Tiger 5

Your committee beg leave to remark that the herd of S. D. Hungerford, Esq., of Adams, Jefferson Co., N. Y., was a fine exhibition, and deserving of special commendation. In the distribution of prizes, the committee have been mainly governed by the developed and prospective milking qualities of the animals passing before them, regarding this as the pre-eminent quality of the Ayrshire breed.

CALVIN T. HULBURD, Brasher Falls,
WILLIAM BIRNIE, Springfield, Mass.,
Committee.

No. 5. JERSEYS—JERSEY HERD PRIZE.

Wm. Crozier, Northport, L. I. .. .. Large Gold Medal.

Bull, "Comet;"

Dark fawn, bred by Robert L. Maitland, Newport, R. I., calved April, 1865; by imported Comet; dam Jersey Belle 2d, by Sark.

Cow, "Josephine;"

Imported 1868; fawn and white, bred by Capt. Amy Grouveille, Isle of Jersey, calved July, 1865.

Cow, "Caroline;"

Imported 1868; dark fawn, bred by Eli Hubert, St. Owens, Isle of Jersey, calved 1864.

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Cow, "Belle of Jersey;"

Fawn and little white, bred by Robert L. Maitland, Newport, R. I., calved February, 1866; by imported Comet; dam Jersey Belle 2d.

Heifer, "Sylvia;"

Fawn and little white, bred by A. S. Rand, Jr., Dedham, Mass., calved February 10, 1867; by Brigham Young; dam Nellie.

Calf, "Bessie 2d;"

Dark fawn, bred by exhibitor, calved March 3, 1869; by Wellington 3d; dam Bessie, by Abraham.

JERSEYS—BULLS.

First prize bull, over 3 years old, Wm. Crozier, Northport, L. I., "Comet;" dark fawn, bred by Robert L. Maitland, Newport, R. I., calved April, 1865; by imported Comet; dam Jersey Belle 2d, by Sark $25

Third, Charles F. Pumpelly, Owego, N. Y., "Fred 2d;" dun and white, bred by R. L. Maitland, Newport, R. I., calved August, 1864; by Sark, imported; dam imported by Mr. Maitland 5

First prize bull, 1 year old, Thos. Gould, Aurora, Cayuga county, N. Y., "Admiral 4th;" fawn and white, bred by Jno. S. Mitchell, calved March 8, 1868; by Admiral; dam Lady Washington, by bull imported by Mr. Davids, of New Rochelle, N. Y 20

Second, John Chadwick, Garrisons, N. Y., "Jupiter;" light dun, bred by W. B. Dinsmore, calved June 6, 1868; by Jerry; dam Delia 10

JERSEYS—COWS.

First prize cow, over 3 years old, Wm. Crozier, Northport, N. Y., "Caroline;" imported 1868; dark fawn, bred by Eli Hubert, St. Owens, Isle of Jersey, calved 1864 20

First prize heifer, 2 years old, Wm. Crozier, Northport, N. York., "Pansy;" fawn, bred by Dr. Wm. H. Smith, Newport, R. I., calved January 24, 1867; by Prince 2d; dam Verana g. d. Verana 1st, imported 20

First prize heifer, 1 year old, Wm. Crozier, Northport, N. Y., "Jersey Belle, 3d;" fawn and white, bred by Edward Howe, Princeton, N. J., calved February 10, 1868; by Don Pedro; dam Jersey Belle 2d, by Sark 15

First prize heifer calf, Wm. Crozier, Northport, N. Y., "Jersey Belle 4th;" fawn, bred by exhibitor, calved March 21, 1869; by Don Pedro; dam Belle of Jersey, by Comet, imported 10

Commended.

Wm. Crozier, Northport, N. Y., "Bessie 2d;" dark fawn, bred by exhibitor, calved March 3, 1869; by Wellington 3d; dam Bessie, by Abraham.

The undersigned, committee of judges in class one, No. five, Jersey cattle, beg to report:

Your judges, on receipt of your circular, appointing, for the first time, they believe, a distinct committee on Jerseys, regarded it as an evidence of the Society's recognition of the growing importance of this interest in the State; and the breeders seemed to justify such appreciation of it by the number of entries made. Your committee, therefore, experienced the greater disappointment on finding that only a little more

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than one-fourth of the animals entered were present. They were witnesses of the chagrin of a number of visitors from adjoining States, who were induced to attend the fair by the expected exhibition of so fine a show of this stock. But apart from this, your committee cannot forbear expressing their sense of the injustice of subjecting the Society to the expense of printing and the preparation of accommodations, left vacant during the continuance of the fair.

Of the thirteen animals (out of forty-three entries) which had put in an appearance, Mr. Wm. Crozier, of Northport, Long Island, exhibited ten. In the section of bulls, over three years old, Mr. Crozier's "Comet" received the first prize. This is a superior animal; but in the opinion of your committee, is, for a getter of dairy stock, too fat for service. A third prize was awarded to Mr. C. F. Pumpelly, Owego, for "Fred 2d." Bulls, one year old, to Mr. Thomas Gould, Aurora, for "Admiral 4th," the first prize; and the second prize to "Jupiter," owned by Mr. John Chadwick, of Garrisons, N. Y. The latter bull—preferable in some points and in color of hair—lacked mellow handling and richness in the color of his skin, and liveliness, each of which the former possessed in a high degree.

In cows, over three years old, your committee had some hesitation in choosing between Mr. Crozier's "Josephine" and "Carolina," two beautiful imported cows; but they decided to award the palm to the latter (although showing less constitution and some faultiness in her houghs) on account of her elegant head and exquisite fineness of bone. The aged cow, "Daisy," is in such high flesh (she is dry) that her form is almost concealed by excessive fat. Of the two years old heifers, the first prize was given to Mr. Crozier's "Fanny," and in yearling heifers to "Jersey Belle 3d," a very pretty heifer. Mr. C. also showed two calves, with no competition. Of these "Bessie 2d" took first prize. Mr. Crozier also received, as a matter of course, and deservedly, the Society's Herd Prize Medal.

Before closing this report, your committee would suggest, that in the publication of the regulations in future, the rules for determining the classification of ages be clearly defined, as they found in the case of at least two animals (not prize takers, however,) apparent discrepancies (in the judgment of your committee, based upon physical evidences) between their real ages and the ages assigned to them, respectively, in the catalogue.

Your committee observed some cross-bred bulls (of Jersey and other bloods) on exhibition, merely as extra entries. While presuming that no one will deny that these are better than animals of no breeding at all, your committee would suggest that, perhaps, even this slight countenance given to them is to be regretted, as tending to encourage still the use of other than bulls of pure blood. All of which is respectfully submitted.

THOS. J. HAND, Sing Sing,
B. H. ANDREWS, Waterbury, Conn.,
Committee.

ELMIRA, *September 14th*, 1869.

No. 6. MILCH COWS AND GRADES.

First prize, A. B. Benham, McLean, N. Y., "Ida;" short horn, red and white, bred by exhibitor, calved 1862; by 2d Duke of Oxford; dam Rosette, by Kirkleavington 3d, 611	$20
Second, John C. Welles, Athens, Pennsylvania, "Buff;" calved in the spring of 1862; ¼ Jersey, ¼ Ayrshire	15
Third, John H. Bell, West Brighton, N. Y., "Nina;" short horn, white and red, calved May 3, 1865	5

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Grade Short Horn Cows.

First prize, A. B. Benham, McLean, N. Y., "Miss Brown;" roan, calved 1862; by short horn..... $15

Second, John H. Bell, West Brighton, N. Y., "Lady Darling;" red and white, bred by Joseph Williams, West Henrietta, calved May 6, 1864; by short horn; dam grade short horn..... 10

Third, Robert Bell, West Brighton, N. Y., "Kate;" red and white, bred by B. Fellows, Chili, N. Y., calved July 26, 1866; by Seneca (short horn bred by J. O. Sheldon); dam short horn grade..... 5

Highly Commended.

Robert Bell, West Brighton, N. Y., "Lily May;" red and white, bred by exhibitor, calved June 2, 1868; by Major Jack Downing, short horn; dam Kate, short horn grade.

Grade Devon Cows.

First prize, O. Howland, Auburn, N. Y., "Kate;" red, bred by exhibitor, calved March 20, 1867; sire ¾ Devon, ¼ short horn; dam ¼ Devon, ¾ short horn... 15

Second, Robert Bell, West Brighton, N. Y., "Ida;" red, bred by exhibitor, calved May 28, ——; by Helen's Helena, Devon; dam grade Devon..... 10

Grade Ayrshire Cows and Heifers.

First prize, E. C. Holden, McGrawville, N. Y., "Buttercup;" yellow and white, brown about the head, bred by exhibitor, calved March 29, 1867; by Governor 6th; dam a native cow..... 15

Second, E. C. Holden, McGrawville, N. Y., "Gentle;" red and white, bred by exhibitor, calved March 18, 1868; by Governor 6th; dam native..... 10

Third, J. N. Macomb, Jr., Branchport, Yates county, N. Y., "Victoria;" white with red spots, bred by exhibitor, calved April 16, 1866; by Governor 4th, dam a large light red cow with spots of white..... 5

Grade Alderney Cows.

First prize, M. P. Fitch, Elmira, N. Y., "Bright Eyes;" fawn, white and gray, bred by exhibitor, calved July 4, 1866; by Young Buckskin (Jersey); dam grade short horn..... 15

Second, Chas. F. Pumpelly and W. N. Lane, Owego, N. Y., "Kitty;" white and dun, bred by exhibitors, calved May, 1866; by Fred 2d, by Maitland's Sark; dam ¾ Jersey cow, by the Motley bull Fred 1st..... 10

Third, Chas. F. Pumpelly and W. N. Lane, Owego, N. Y., "Molly;" white, bred by exhibitors, calved 1866; by Fred 2d, by Maitland's Sark; dam ¾ Jersey cow, by the Motley bull Fred 1st..... 5

No 7. Oxen, Steers and Fat Cattle.

Working oxen, over five years old.

First prize, Joel I. Hoyt, Jamestown, N. Y..... 15

Second, Charles H. Roy, French Mills, Bradford county, Penn..... 10

Third, A. B. Rayner, Waverly, Tioga county, N. Y..... 5

Oxen, four years old.

First prize, R. B. Wilkes, Bath, Steuben county, N. Y..... 15

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Steers, three years old.

First prize, Ira Young, Jamestown, N. Y..... $15
Second, O. Howland, Auburn, N. Y..... 10

Steers, trained by boy under sixteen years.

First prize, Jonas Sayre, Horseheads, N. Y..... 10

Fat oxen, over four years old.

First prize ox, Benjamin Fellows, Chili, N. Y..... 15
Second, Craig W. Wadsworth, Geneseo, Livingston county, N. Y..... 10
Third, Benjamin Fellows, Chili, N. Y..... 5

Special.

George Butts, Manlius, N. Y., for a pair of twin oxen (thorough-bred short horns) that would do credit to any breeder, and beautifully matched and ripe in beef..... 10

Fat steers, under four years old.

First prize, O. Howland, Auburn, N. Y..... 15

Fat cows, over four years old.

Second prize, O. Howland, Auburn, N. Y..... 10

Fat heifers, under four years old.

First prize, John H. Bell, West Brighton, N. Y..... 15

Your committee would respectfully award the premiums above noted, and would particularly notice the unequaled show of fat stock in the class of fat oxen, and would condemn the practice of allowing a grade bull of any breed to be even exhibited on the ground.

DANIEL B. HAIGHT, Dover Plains,
JOSEPH JULIAND 2D, Bainbridge,
Committee.

CLASS II—HORSES.

No. 8. BREEDING AND GROWING STOCK.

Stallions for general purposes, over four years old.

SPECIAL PRIZE.

Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "The Marshal;" thorough-bred, sixteen hands, blood bay, foaled 1863; by Lexington; dam Ariel, by imported Sarpedon..... $200
First prize, Geo. J. Pumpelly, Owego, N. Y., "Young Sweetmeat;" thorough-bred, dark bay, twelve years, sixteen hands, imported by R. W. Cameron; by Sweetmeat; dam Miter, by Cowl..... 50
Second, E. W. Taylor, Elmira, N. Y., "Hambletonian La Fayette;" bay, 10 years, 15¼ hands..... 30
Third, J. E. Wood, Middletown, Orange county, N. Y., "Knickerbocker;" dark mahogany bay, with black points and star in forehead; bred by exhibitor; foaled 27th March, 1865; by Rysdyk's Hambletonian; dam by George M. Patchen, 16 hands..... 15

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Draught stallions, over four years old.

First prize, William Innis, Richmond Hill, York, Ontario, Canada, "Little John;" dappled black, 7 years old, 16¼ hands, by Robin Hood; dam by Messenger $20
Second, William Crozier, Northport, L. I., "Lord Clyde;" bay, 16 hands, 8 years 15

Stallions for getting roadsters.

First prize, D. B. Irwin, Middletown, Orange county, N. Y., "Middletown;" 8 years, rich blood bay, aged, 15½ hands; by Rysdyk's Hambletonian; dam by American Eclipse 20
Second, Andrew J. Bennett, Horseheads, Chemung county, N. Y., "——;" 8 years old, bay, 15.3; by Magnolia; dam by old Fox Hunter 15
Third, L. C. Bennett, Wellsborough, N. Y., "Bunnell Boy;" dark bay, 6 years, 15½ hands; by Jupiter; dam Fanny Elssler 10

Three years old stallions.

First prize, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Orion;" steel gray, foaled July 6, 1866; by Rysdyk's Hambletonian; dam May, by St. Nicholas, &c 15
Second, G. H. Post, Elmira, N. Y., "William Tell;" bay, 15.1 10
Third, G. H. Take, Canandaigua, N. Y., "——;" dark bay, 15½ hands 5

Two years old stallions.

First prize, T. S. Armstrong, Owego, N. Y., "——;" brown, 15 hands 15
Second, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Arcturus;" bay, with three white feet and small star, foaled July 7, 1867; by Rysdyk's Hambletonian; dam June, by St. Nicholas, &c 10
Third, Harry Mix, Towanda, Bradford county, Pa., "Towanda;" bay, 15.1; by the Ah-wa-ga Chief by Rydsyk's Hambletonian; dam Vermont Black Hawk, gr. d. Messenger 5

Yearling stallions.

First prize, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Sirius;" bay, with three white feet, and small strip, foaled June 12, 1868; by Pearsall's Hambletonian Prize Fighter; dam June, by St. Nicholas 10
Second, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Marvel;" thorough-bred, blood bay, foaled May 24, 1868; by The Marshal; dam Lady Spang, by Gazan, &c 8
Third, J. N. Macomb, Jr., Branchport, Yates county, N. Y., "Clayton;" chestnut, 14.2½; by Andy Johnson; dam Minnie, by Bedloe's Pirate 4

Brood mares with foals at foot.

First prize, Jas. N. Spencer, Horseheads, N. Y 20
Second, B. J. Stryker, Elmira, N. Y 15
Third, Andrew J. Bennett, Horseheads, N. Y 10

Three years old fillies.

First prize, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Juno;" gray, foaled July 24, 1866; by Rysdyk's Hambletonian; dam June, by St. Nicholas 15

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Second, Robert Bell, West Brighton, Monroe county, N. Y., brown, 15½ hands $10
Third, David Decker, Elmira, N. Y., bay, 15 hands; by Taylor's La Fayette 5

Two years old fillies.

First prize, Decker Lee, Havana, Schuyler county, N. Y., dark bay, 15½ hands; by Taylor's La Fayette..... 15
Second, J. C. Todd, Elmira, N. Y., brown, 15½ hands..... 10
Third, M. P. Fitch, Elmira, N. Y., bay; by Taylor's La Fayette..... 5

Yearling fillies.

First prize, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Mimosa;" thorough-bred, sorrel, foaled April 13, 1868; by The Marshal; dam Miss Trustee, by Breckenridge..... 10
Second, Lewis G. Morris, Mount Fordham, Westchester county, N. Y., "Migonette;" thorough-bred, bay, foaled May 3, 1868; by The Marshal; dam Ellen Bateman, by imported Glencoe..... 8
Third, A. Whitcomb, Horseheads, N. Y., sorrel, 14 hands..... 4

JOHN McGRAW, Ithaca,
LEWIS B. BROWN, New York,
Committee.

No. 9. HARNESS AND SADDLE HORSES.

Carriage horses sixteen hands high.

First prize, Henry Vosburgh, Port Byron, Cayuga county, N. Y., bay horses, 16 and 16½ hands high, 5 years, $2,500..... $20
Second, Thomas Clarke, Buffalo, N. Y., bay, 16 hands..... 10

Carriage horses fifteen and under sixteen hands.

First prize, Mrs. Craig W. Wadsworth, Geneseo, Livingston county, N. Y., dark bay horses, 6 years, 15.2½..... 20
Second, David Decker, Elmira, N. Y., bay, 6 and 7 years old, 15 and 16 hands 10
Third, Lee Weller, Tyrone, Schuyler county, N. Y., brown horses, 5 and 6 years old, 15½ hands..... 5

Driving or road horses not under fourteen and a half hands.

First prize, Robert Bell, West Brighton, N. Y., bay horses, 15½ hands, 8 and 9 years old..... 15
Second, William Gustir, Elmira, N. Y., roan horses, 4 and 6 years old, 15½ hands..... 10
Third, George J. Pumpelly, Owego, bay and chestnut mares, 14½ hands..... 5

Draught or farm horses.

First prize, Cayuga Chief Manufacturing Co., Auburn, N. Y., chestnut, 7 and 8 years old, 16 hands..... 20
Second, Dodge & Stevenson Manufacturing Co., Auburn, N. Y., gray, 16 hands, 9 years..... 10
Third, David B. Stryker, Elmira, N. Y., gray, 7 and 8 years old, 15 hands..... 5

Single harness horses.

First prize, Wilson Dean, Horseheads, N. Y., bay mare, 5 years old, 16 hands; by McConnell's Champion; dam by Gifford's Morgan..... 10

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Second, George E. Stanley, Breeseport, Chemung county, N. Y., bay horse, 8 years old, 15½ hands $8
Third, H. Schoonmaker, Cedar Hill, Albany county, N. Y., gray gelding, 6 years old, 16 hands 4

Single driving horses.

First Prize, S. D. Hungerford, Adams, N. Y., bay gelding, 9 years, 15¼ hands 10
Second, Andrew J. Bennett, Horseheads, N. Y., brown horse, 6 years, 15½ hands 8
Third, S. D. Hungerford, Adams, N. Y., brown mare, 5 years old, 15¼ hands.. 4

Saddle horses.

First prize, L. G. Morris, Mount Fordham, N. Y., white mare, aged; Gray Eagle and Medoc blood 10

Commended.

William Crozier, Northport, N. Y., Shetland pony, "Garry," brown and white, 7 years, 9½ hands.

No. 10. JACKS AND MULES.

Jacks.

First prize, C. B. Lake, Candor, N. Y., "Young Magel;" gray, 4 years, 14½ hands; by Kentucky Magel 15
Second, L. B. Faulkner, Waverly, Tioga county, N. Y., "Napoleon;" dun, 8 years, 13½ hands 10

In addition to the above, we examined a very fine large sorrel horse, 18 hands high, weighing 1,900 pounds, belonging to Nathan Rose, Belmont, N. Y. As he did not come in any class of horses for a prize, we submit him to some notice, as we think him a superior horse of his size.

A. B. RAYMOND, New York,
B. A. SWEET, Albany,
Committee.

CLASS III.—SHEEP, SWINE AND POULTRY.

No. 11. FAT SHEEP AND GRADE OR CROSS-BRED EWES AND LAMBS, BRED CHIEFLY FOR MUTTON.

Fat sheep, long-wooled, over two years.

First prize, Walcott & Campbell, New York Mills..... $5

Fat sheep, long-wooled, under two years.

First prize, Walcott & Campbell, New York Mills..... 5

Fat sheep, middle-wooled, over two years.

First prize, E. Cornell, Ithaca 5
Second, E. Cornell, Ithaca..... 3
Third, John Lynch, W. Brighton, Monroe county, N. Y..... 1

Fat sheep, cross-bred, over two years.

First prize, O. Howland, Auburn 5

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Fat sheep, cross-bred, under two years.

Second prize, O. Howland, Auburn $3

No. 12. LONG-WOOLED SHEEP.

Leicester rams, over two years.

First prize, Jurian Winne, Bethlehem Center, N. Y. 10

Leicester rams, under two years.

First prize, Walcott & Campbell, New York Mills, N. Y. 10
Second, Walcott & Campbell, New York Mills, N. Y. 8
Third, Jurian Winne, Bethlehem Center, N. Y. 4

Pens of (3) *Leicester ram lambs.*

First prize, Jurian Winne, Bethlehem Center, N. Y. 5

Pens of (3) *Leicester ewes, over two years.*

First prize, Walcott & Campbell, New York Mills, N. Y. 10
Second, Jurian Winne, Bethlehem Center, N. Y. 8

Pens of (3) *Leicester ewes under two years.*

First prize, Jurian Winne 10

Pens of (3) *Leicester ewe lambs.*

First prize, Jurian Winne 5

Cotswold rams, over two years.

First prize, John D. Wing, Washington, Dutchess county, N. Y. 10

Pens of (3) *Cotswold ram lambs.*

First prize, John D. Wing 5

Pens of (3) *Cotswold ewes, over two years.*

First prize, John D. Wing 10

Pens of (3) *Cotswold ewes, under two years.*

First prize, John D. Wing 10

Pens of (3) *Cotswold ewe lambs.*

First prize, John D. Wing 5

Lincoln rams over two years.

First prize, Walcott & Campbell, New York Mills, N. Y. 10

Lincoln rams under two years.

First prize, Walcott & Campbell 10

Pens of (3) *Lincoln ewes over two years.*

First prize, Walcott & Campbell 10

Pens of (3) *Lincoln ewes one year old.*

First prize, Walcott & Campbell 10

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No. 13. Middle-wooled Sheep.

Southdown rams over two years.

First prize, John Lynch, West Brighton, N. Y.	$10

Southdown rams under two years.

First prize, E. Cornell, Ithaca, N. Y.	10
Second, John Lynch	8
Third, John Lynch	4

Pens of (3) *Southdown ram lambs.*

First prize, E. Cornell	5

Pens of (3) *Southdown ewes over two years.*

First prize, E. Cornell	10
Second, John Lynch	8

Pens of (3) *Southdown ewes under two years.*

First prize, John Lynch	10

Your Committee would mention a pen of three Southdown Ewe Lambs (not entered on list), exhibited by E. Cornell. They are very fine.

No. 14. Fine-wooled Sheep—A. Merinos bred Specially for Fineness of Wool.

Rams over two years old.

First prize, Wm. Chamberlain, Red Hook, N. Y.	$10
Second, Wm. Chamberlain	8
Third, Carl Heyne, Red Hook, N. Y	4

Rams under two years old.

First prize, Wm. Chamberlain	10
Second, Wm. Chamberlain	8
Third, Carl Heyne	4

Pens of (3) *lamb rams.*

First prize, Carl Heyne	5
Second, Wm. Chamberlain	3

Pens of (3) *ewes over two years old.*

First prize, Wm. Chamberlain	10
Second, Carl Heyne	8
Third, Wm. Chamberlain	4

Pens of (3) *ewes under two years old.*

First prize, Wm. Chamberlain	10
Second, Carl Heyne	8
Third, Wm. Chamberlain	4

Pens of (3) *ewe lambs.*

First prize, Wm. Chamberlain	5
Second, Carl Heyne	3

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B, MERINO SHEEP BRED SPECIALLY FOR WEIGHT OF FLEECE.

Rams over two years old.

First prize, Bronson & Marriner, East Bloomfield, Ontario county, N. Y.....	$10
Second, Peter and George F. Martin, East Rush, Monroe county, N. Y	8
Third, Wm. Chamberlain....	4

Rams under two years old.

First prize, Bronson & Marriner.....	10
Second, Peter and Geo. F. Martin.....	8
Third, Wm. Chamberlain.....	4

Pens of (3) ram lambs.

First prize, Bronson & Marriner.....	5
Second, Wm. Chamberlain.....	3

Pens of (3) ewes over two years old.

First prize, Peter and Geo. F. Martin.....	10
Second, Bronson & Marriner	8
Third, Charles Stone, Rushville, N. Y.....	4

Pens of (3) ewes under two years old.

First prize, Bronson & Marriner	10
Second, Charles Stone	8
Third, Peter and Geo. F. Martin.....	4

Pens of (3) ewe lambs.

First prize, Bronson & Marriner	5
Second, Peter and Geo. F. Martin	3

GRADE MERINOS, OR SHEEP OF MIXED BREED, BRED CHIEFLY FOR WOOL.

Pens of (3) ewes over two years old.

First prize, Wm. Chamberlain.....	3
Second, R. E. Moss, Elmira, N. Y.....	1

Pens of (3) ewes under two years old.

First prize, Wm. Chamberlain.....	3
Second, Robert Bell, West Brighton, N. Y.....	1

Pens of (3) ewe lambs.

First prize, William Chamberlain.....	5

O. F. MARSHALL, Wheeler, N. Y.,
PARSOLL H. PETERSON, Rochester, N. Y.,
Committee.

No. 15. SWINE.

Boars of large breed, over two years.

First prize, T. T. Cavanagh, Watertown, N. Y.....	$10
Second, Clark & McLean, Henderson, N. Y., Cheshire.....	8
Third, Brodie & Son, Rural Hill, N. Y., Yorkshire.....	4

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Boars of large breed, over one year old.

First prize, Brodie & Son	$10
Second, Clark & McLean	8

Boars of large breed, six months and less than one year.

First prize, A. L. Thomas, Cuba, N. Y.	8
Second, Clark & McLean	5
Third, Benjamin Fellows, Chili, N. Y., Cheshire	3

Breeding sows of large breed, over two years old.

First prize, Brodie & Son	10
Second, A. L. Thomas	8
Third, Clark & McLean	4

Sows of large breed, one year old.

First prize, Clark & McLean	10
Second, T. T. Cavanagh	8
Third, A. B. Benham, McLean, N. Y.	4

Sow pigs of large breed, over six months old.

First prize, T. T. Cavanagh	6
Second, Clark & McLean	5
Third, A. L. Thomas	3

Pens of (5) pigs of large breed, under ten months old.

First prize, Clark & McLean	8
Second, Clark & McLean	5
Third, T. T. Cavanagh	3

Boars of small breed, one year old.

First prize, Joseph Harris, Rochester, N. Y., Essex	10

Boars of small breed, six months and less than one year.

First prize, William Crozier, Northport, N. Y., Berkshire	8

Breeding sows of small breed, over two years old.

First prize, Joseph Harris	10
Second, Robert Bell, West Brighton, N. Y.	8

Sows of small breed, one year old.

First prize, Joseph Harris	10

Pens of (5) pigs, small breed under ten months old.

First prize, Joseph Harris	8

S. S. WHITMAN, Little Falls,
HUGH HEUSTIS, Adams, N. Y.,
Committee.

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No. 16. POULTRY, FOWLS, RABBITS.

[This mark (*) denotes that the prize fowls have been certified by a committee of the New York State Poultry Society, to be strictly first-class and meritorious specimens of their respective breeds, and that the exhibitors are entitled in these cases to the Society's Large Silver Medal instead of the money prize, under the resolution of the Executive Committee, published in the Premium List.]

*First prize Gray Dorkings, J. Y. Bicknell, Westmoreland, N. Y.	$5
Second, Gray Dorkings, G. H. Warner, New York Mills	3
*First prize White Dorkings, Wm. Crozier, Northport, L. I	5
Second, White Dorkings, J. Y. Bicknell, Westmoreland, N. Y.	3
First prize Black Spanish, D. C. Brown, Elmira, N. Y.	5
Second, Black Spanish, Wm. Crozier, Northport, L. I.	3
First prize Black Polands, H. Clay Gavit, New York	5
First prize Silver Polands, H. Clay Gavit, New York	5
*First prize Red Game, J. Y. Bicknell, Westmoreland, N. Y.	5
Second, Red Game, R. Gibson, New York Mills, N. Y.	3
*First prize Gray Game, J. Y. Bicknell, Westmoreland, N. Y.	5
Second, Gray Game, C. S. White, Elmira	3
First prize Pile Game, J. Y. Bicknell, Westmoreland, N. Y.	5
*First prize Leghorns, J. Y. Bicknell, Westmoreland, N. Y.	5
Second, Leghorns, H. Clay Gavit, New York	3
*First prize African Bantams, H. Clay Gavit, New York	5
Second, African Bantams, E. A. Wendell, Albany	3
*First prize Gold-laced Bantams, H. Clay Gavit, New York	5
Second, Gold-laced Bantams, E. A. Wendell, Albany	3
*First prize Silver-laced Bantams, George H. Warner, New York Mills	5
*First prize Cochins, H. Clay Gavit, New York	5
Second, Cochins, George H. Warner, New York Mills	3
*First prize Light Brahmas, George H. Warner, New York Mills	5
Second, Light Brahmas, Geo. H. Warner, New York Mills	3
*First prize Dark Brahmas, Geo. H. Warner	5
Second, Dark Brahmas, H. Clay Gavit, New York	3
*First prize Hamburghs, H. Clay Gavit	5
Second, Hamburghs, H. Clay Gavit	3
*First prize Houdans, J. Y. Bicknell, Westmoreland, N. Y	5
Second, Houdans, Geo. H. Warner, New York Mills	3
*First prize Crevecœurs, H. Clay Gavit, New York	5
Second, Crevecœurs, J. Y. Bicknell, Westmoreland	3
*First prize La Fleche, Geo. H. Warner, New York Mills	5
*First prize Sultans, H. Clay Gavit, New York	5

Turkeys.

First prize bronze turkeys, E. A. Wendell, Albany	5
Second, bronze turkeys, O. Howland, Auburn	3
Second, common black or brown turkeys, Robert Bell, West Brighton, N. Y.	3
*First prize white turkeys, Thomas Gould, Aurora, N. Y.	5
Second, white turkeys, E. A. Wendell, Albany	3

Ducks.

First prize Muscovy, H. Clay Gavit, New York	5
Second, Muscovy, O. Howland, Auburn, N. Y	3
*First prize Aylesbury, Geo. H. Warner, New York Mills	5

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Second, Aylesbury, H. Clay Gavit, New York..... $3
* First prize Rouen, Geo. H. Warner, New York Mills..... 5
Second, Rouen, J. Y. Bicknell, Westmoreland..... 3
First prize Cayuga, O. Howland, Auburn..... 5
Second, Cayuga, O. Howland, Auburn..... 3

Geese.

* First prize Bremen, H. Clay Gavit, New York..... 5
* First prize White China, E. A. Wendell, Albany..... 5
* First prize Brown China, E. A. Wendell..... 5
* First prize Toulouse, H. Clay Gavit, New York..... 5
Second, wild, Wisner J. Roy, French Mills, Pa..... 3

Guinea fowls.

First prize, E. A. Wendell, Albany..... 5

Pigeons.

First prize, Fred. N. Dounce, Elmira..... 5

Lop-eared or Madagascar rabbits.

*First prize, John Haven, Fort Washington, New York city..... 5
Second, John Haven, Fort Washington, N. Y., city..... 3

Commended.

Trio Nankin Bantams, E. A. Wendell, Albany.
Trio White Bantams, H. Clay Gavit, New York.
Trio Black-breasted Game Bantams, R. Gibson, New York Mills.
Pair Golden Pheasants, H. Clay Gavit, New York.
Egyptian Buck, John Haven, Fort Washington, New York city.
Egyptian Doe and Young, John Haven, Fort Washington, New York city.

MASON C. WELD, New York,
GEORGE TWEDDLE, Albany,
Committee.

CLASS IV—IMPLEMENTS AND MACHINES.

No. 17. IMPLEMENTS REQUIRING TRIAL IN THE FIELD.

First prize stump machine, George Chamberlain & Son, Olean; George Chamberlain's Double Thread Vibrating Screw Stump Puller. Price $200.. Large Bronze Medal.

First prize tile machine, J. W. Penfield, Willoughby, Lake county, Ohio; Drain Tile Machine. Price $400..... Large Bronze Medal

First prize potato planter, N. B. Sherwood, Millville, Orleans county; Sherwood's Patent Potato Planter, on wheels, to mark furrow, drop and cover. Price $50..... Large Bronze Medal.

First prize scraper, D. B. Nelson and Morgan Dyer, Elmira; D. B. Nelson and Morgan Dyer's Plowing Scraper for moving earth. Price $25..... .. Large Bronze Medal.

Special prizes.

Titus & Bostwick, Ithaca; Wheel Rake and Broadcast Sower, combined. Rake $42, sower $23; total $65..... Large Bronze Medal.

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George S. Batcheller, Saratoga Springs; Smith's Patent Horse Rake and Gleaner; the teeth are made of wood, and have independent action; claims to gather hay free from dust, and well adapted to gleaning grain fields.... Large Bronze Medal.

Commended.

The following articles, entered in this division, are commended by the judges, and the exhibitors are entitled to certificates of merit:

L. B. Taylor, Granville Center, Penn.; Combined Land Roller, Seed Sower and Fertilizer, 880 pounds. Price $60.

D. H. Goodell & Co., Antrim, N. H.; Cahoon's Broadcast Seed Sower, power. Price $60.

T. H. Arnold, Troy, Penn.; Hay Pitcher or Carrier consisting of a horizontal beam provided with a sliding carrier operated by means of ropes and pullies, whereby the forks, when elevated to a given height, are carried in a horizontal direction to any point under the beam, by sliding of said carrier along the beam.

Paris Furnace Company, Clayville, N. Y.; Post Pulley, to be attached to top of post and employed in reducing the travel of horse in working fork and car, 12 lbs. Price $4.

Paris Furnace Company, Clayville; Attaching Grapples, for suspending certain of the pulleys, with fork, 8 lbs. Price $3 per pair.

J. A. Park, Lansing, Michigan; Park's Horse Power Pitch Fork.

Thomas J. Powell, Naples; Powell's Patent Hay Elevator and Conveyor, to run on wooden track, 35 lbs., 11½ in. long, 5 in. wide. Price $10.

A. T. Haverland, Elmira, N. Y.; Boring Machines, for ship treenailing.

Stillwell & Bierce, Dayton, Montgomery Co., Ohio; Stillwell's Patent Heater and Lime Catcher, for heating and purifying the feed-water for steam boilers, by using either escape steam from a steam engine, or live steam direct from the boiler, 700 lbs., 6 ft. long, 24 in. diameter. Price $200.

Decker & Shreffler, Elmira, N. Y.; Brick Machine, 1,300 lbs., 3x5 ft. Price $350.

F. W. Collins, Rochester, N. Y.; improved method of training hops; Collins' Patent Horizontal Hop Trainer.

William P. Jones, Troy, N. Y.; Anti Friction Metal for all kinds of bearings in machinery; improved in 1869. Retail price 25c. per lb.

Foster & Witt, Horseheads and Elmira, N. Y.; The Draughtman's Improved T Square for laying off angles and reverse oblique lines without resetting the instrument. Price $25.

No. 18. IMPLEMENTS TRIED ON THE FAIR GROUND, OR NOT REQUIRING TRIAL.

First prize hay or cattle scale, Jones' Scale Works, Binghamton, N. Y.; 4 ton scale, 9x16 ft. Price $75 ..... Large Bronze Medal.

First prize fanning mill, E. F. Gilbert, Lyons; John Gilbert's Improved Fanning Mill. Price $27..... Large Bronze Medal.

First prize grain separator, Wheat & Perry, Rochester; Flour City Grain Cleaner, two sizes. Prices $35 and $45..... ..... Large Bronze Medal.

First prize feed cutter, Fulton Manufacturing Company, Fulton; Cummings' Improved Feed Cutter, four sizes, for hand and power. Prices $26, $32, $65, $100 ..... Large Bronze Medal.

First prize corn sheller, Harmon W. Cornell, Owego; Corn Sheller, Cornell's Patent, cylinders 7 in. long, hand or power ..... Large Bronze Medal.

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First prize, cider mill, Warder, Mitchell & Co., Springfield, Ohio; Improved Buckeye Cider and Wine Mill, 350 lbs., 4½x2½ ft. Price $45. The adjustable throat adapts it to grinding all kinds and sizes of fruit. The grinding rollers are also adjustable. The box is metallic, beam and screw iron. The grinding apparatus is serrated ribs on one roller, working against the straight ribs on the other, giving thereby a shearing cut, and requiring less power. It has a strainer board under the tub ..... Large Bronze Medal.

First prize root cutter, John R. Robertson, Syracuse; Robertson's Excelsior Vegetable Cutter. Price $14 ..... Large Bronze Medal.

First prize pump, J. J. Van Zandt, Rochester; The Patric Stock Pump, by which animals raise the water when they walk on the platform. Price $60..... Large Bronze Medal.

First prize washing machine, C. W. Hermance, Schuylerville, Saratoga county; Champion Wash Boiler. Price $8..... Large Bronze Medal.

First prize, churn, George N. Palmer, Greene; Refrigerating Churn. Price $10..... Large Bronze Medal.

First prize planing machine, Frank & Co., Buffalo; Machine for Planing Door Panels, 400 lbs., 3x3 ft. Price $100..... Large Bronze Medal.

First prize machine for sharpening mowing and reaping machine knives, Emery Grinder Company, Auburn, N. Y., E. G. Storke, Secretary; Palmer's Grinder, 25 lbs., 20x24 in. Price $10..... Large Bronze Medal.

Commended.

The following articles entered in this division are commended by the Judges, and the exhibitors are entitled to Certificates of Merit:

J. W. Mount, Medina, Orleans county; "Tornado Root Cutter," for cutting roots for feed, 200 lbs., 2x2 ft. Price $25.

Samuel Males, Cincinnati, Ohio; American Wine and Cider Mill, feeds, crushes and discharges the fruit with the same motion, and the quantity of wine or cider produced is twenty-five per cent more than ordinarily secured. Will grind from forty to sixty bushels of apples per hour.

J. W. Mount, Medina, Orleans, county; pair Buell Brothers Patent Screws, with attachment, operated by machine power, by levers, as used in Buell's improved screw press, 350 lbs., 3½ in.x5 ft. Price $110.

J. W. Mount, Medina, Orleans county; Mount's Patent Combined Drag and Circular Saw, used for sawing off logs any required length, or for sawing up wood for fuel, 700 lbs., 12x16 ft. Price $125.

E. W. Branch, Medina, Orleans county, Branch's Improved Grinder for apples and grapes, 200 lbs., 2x2 ft. Price $60.

J. D. Smith, Greig, Lewis county; Smith's Automatic Machine for grinding edge tools. It is used in connection with the common grindstone to hold the tool in position, and is supplied with an automatic feed. It grinds the tool perfectly, and at the same time keeps the stone true. Stone and fixtures, $50.

Continental Windmill Company, 3 Barclay street, New York; self-regulating windmill for raising and supplying water. Prices $350 to $400.

P. K. Dederick, Albany; Dederick's Patent Hand Hay Press, 800 lbs., 6½x5x4 ft. Price $100.

J. Waugh, Elmira; Waugh's Patent Paper Trimmer, 2½ ft.x10 in. Price $15.

J. Waugh, Elmira; Waugh's Patent Metallic Plate Cutting Machine, for power, 250 lbs., 4 ft.x6 in. Price $75.

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J. Waugh, Elmira; Waugh's Patent Metallic Plate Cutting Machine, worked by hand, 85 lbs., 2 ft. 4 in.x6 in. Price $48.

J. B. Hendy, Olean, Cattaraugus county; Model of Machine for bolting shingle blocks.

Thomas Johnson, Elmira; Foot Lathe, with attachment for turning iron, steel and wood, and drilling the same. Price $200.

Wells & Kneeland, Le Roy, Genesee county; McLea's Patent Eavetrough and Cornice Former, a machine designed to form sheet metal in any desired shape by one operation. Price $15.

No. 19. TOOLS AND HAND IMPLEMENTS FOR THE FARM AND GARDEN.

First prize grain cradle, John G. Burritt, Elmira; grape vine fingers. Price $4	$5
Second, A. Strader, Elmira. Price $6 each	3
First prize steel garden rakes, Remington Agricultural Works; F. T. Woodford, general agent, Utica	5
Second, Williamsport Manufacturing Company, Williamsport, Pa.	3
First prize hay forks, Williamsport Manufacturing Company, Williamsport, Pa.	5
First prize manure forks, Williamsport Manufacturing Company, Williamsport, Pa.	5
First prize spading forks, Williamsport Manufacturing Company, Williamsport, Pa.	5
First prize hoes, L. Bolles, Binghamton	5
First prize potato forks, Williamsport Manufacturing Company, Williamsport, Pa.	5
First prize axes, Robert Mann, Elmira	5
First prize files, J. S. Irwin, Rochester	5
First prize augers and boring implements, Noble Manufacturing Company, Elmira	5
First prize assortment of farm and garden tools and implements, Remington Agricultural Works, F. T. Woodford, general agent, Utica	10
First prize saws, Andrews & Burbage, Elmira	5
First prize jars for preserving fruit, &c., "Mason's," Mason Manufacturing Company, 9 Bedford street, New York	8
First prize draining tiles, J. W. Penfield, Willoughby, Lake county, Ohio	5
First prize butter firkins, J. Byrne & Son, Elmira (iron bound kegs)	5

Highly commended.

The following articles are highly commended by the judges, and the exhibitors are entitled to certificates of highest merit:

John McCowan, Lockport; milk rack and table combined. Price $8 to $10.

Seeley & Dorn, Albany; Dorn & Seeley's American Egg Carrier; patented April 20, 1869.

Metallic Plane Company, Auburn; Palmer's Iron Jointer Plane, $6; Palmer's Jack Plane, $6.50; Palmer's Smoothing Plane, $4.50.

Fish & Short, Mechanicsburg, Penn.; Fish's Patent Champion Tuyere.

Commended.

The following articles are commended by the Judges, and the exhibitors are entitled to certificates of merit:

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H. W. McIntire, Elmira; Circular and Gig Sawing and Boring Machine. Price $185.

J. H. & D. A. Larnent, Troy, Bradford county, Penn.; Universal Fruit Picker, 8x12 inches. Price $2.

William Ralph & Co., Utica; "American" Curd Mill, double cylinder, for cheese factory, 60 pounds, 4x2 feet. Price $25.

J. A. Davis, Watertown; Davis' Patent Steam Generator.

Arthur Holmes, Cortland, Cortland county; the Spencer Milk Cooler. Consists of a milk pan resting in another pan, or metal lining to the frame which supports the pans, with space between the pans for water, and provision for running water, and for removing the water or milk without disturbing the water when drawing the milk, or *vice versa;* 80 lbs. weight, and holds 26 gallons of milk; 5 ft. 4 in.x1 ft. 10 in. Price $10.

Riggs & Markham, Turin, Lewis county; Patent Milk Cooler. Price $20.

Andrew Pope, Randolph; apparatus for obtaining cream from milk.

D. H. Goodell & Co., Antrim, New Hampshire; Lightning Peach Parer. Price $1.25.

P. B. Sheldon, Bath, Steuben county; Samples Ornamental Flower Frames.

Shelby Reed, Scottsville, Monroe county; Reed's three tier Shelter Sheep Rack, is 8x14 feet on the ground, and about twelve feet high, a light frame roof and sided, alley in middle reaching to the roof, and contains mangers; three tiers of apartments on each side of alley; can be drawn about the farm with a team, and is intended to hold six sheep per lineal foot.

Edwin R. Austin, Elmira; Austin's Adjustable Step Ladder, 9 ft. high, 34 lbs., 3x4 ft., $6.50; 6 ft. high, 21 lbs., 2½x3½ ft., $4. These ladders are intended for painters, paper hangers and house use, and fruit picking; adjustable on uneven surfaces; secure and safe.

G. L. Rice, Clifton Springs; Rice's Carpet Rag Looper, 5x16 inches. Price $1.

Rowland & Beadle, Elmira; samples of Wire Goods.

Nathan Rose, Belmont, Allegany Co.; Rose's Mill Pick and Holder, $10. By this arrangement points are used for the dressing of mill stones. A dull one can be readily replaced with a sharp one. One point will last as long as the dressing and tempering of three picks; points $10 per 100.

No. 20. Wagons, Carriages, Saddlery and Articles of Wheelwrights' and Blacksmiths' Work.

First prize, Double Covered Carriage, Jas. Ewing, Elmira	$10
First prize Double Pleasure Wagon, Jas. Ewing, Elmira	10
Second, Taber & Martin, Canandaigua	5
First prize Top Buggy, Jas. Ewing, Elmira	10
First prize Open Buggy, Jas. Ewing, Elmira	10
Second, H. J. Edwards, Syracuse	5
First Prize Single Sleigh, Jas. Ewing, Elmira	10
First prize Double Farm Wagon, J. H. Wilson & Co., Whitestown, N. Y.	10
Second, J. E. Morgan, Deerfield, N. Y.	5
First prize Field Roller, Herald & Andrews, Watkins, N. Y.; 1,000 lbs., 7x3 ft. Price $50	5
First prize Ox Yoke, G. M. Card, Sylvania, Pa	5
First prize Carriage Harness, John Taylor, Auburn	5
First prize Single Harness, John Taylor, Auburn	5
Second, Single Harness, Charles H. Wheadon, Homer	3

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Commended.

The following articles are commended by the judges, and the exhibitors are entitled to Certificates of Merit:

Hawley, McClure & Co., Utica; Thimble Skeins and Boxes.

Charles H. Adams & Co., Union Springs, Cayuga Co.; Wagon Bows, Buggy Bows, Carriage Poles, Buggy Shafts, Buggy Fellies, Fellies, Bob Runners, Fenders, Seat Rails, Spokes and Hubs.

Wm. Selover & Co., Moravia, spokes.

J. B. Pierson & Co. Union Springs, Wagon Hubs.

H. McDonald & Co., Shortsville, Ontario Co., Fellies.

J. C. Lighthouse, Rochester, Assortment Case Collars.

A. A. Stannard, long Straw Horse Collars.

Townsend Johnson, Hornellsville; Automatic Stove Damper.

DYER WILLIAMS, Syracuse,
S. D. BALDWIN, Yonkers,
A. A. SWEET, Syracuse,
Committee.

REPORT ON MACHINES ENTERED FOR TRIAL.

The Special Committee on Field Trials report that the following machines were entered for such trials:

Osborn, Foster & Co., Palmyra; broad-cast sower. Sows 7 feet and 8½ feet wide. Weight 450 lbs. Price $80.

It has eight independent cultivator teeth in the rear, which cover the grain after being sown; they are reversible and of unusual thickness. The grain is placed in a triangular box with a slit in the apex, which is directed downward, the width in the slit is raised from one-sixteenth to one-half an inch by means of a strip of iron which is raised or depressed by means of crooked levers worked by a lateral rod. By this means the operator can sow from one bushel up to ten bushels per acre; the amount at any time given is regulated by a dial which indicates precisely the amount sown.

The grain is agitated by the vibration of teeth, the apexes of which are two inches apart. The apparatus is transformed into a plaster sower by simply taking out the false back; grass seeds may also be distributed from the same box. The machine stands seventeen inches from the ground; the cultivator teeth can be raised or lowered by a lever either before or behind.

Bickford & Hoffman, Grain Drill. Weight 500 pounds. Price $85.

This well known machine which has so often and so deservedly received the commendation of the society, presents the following improvements over those hitherto exhibited. The hub is increased in diameter, so as to give one inch more length of tenon to the spokes. It is made of hard wood throughout. It has been supplied with intermediate wheels which double the number of variations that could be previously given to it. The elongated funnel of former times is replaced by two funnels, the end of one entering the upper part of the one below it, the upper one being of gutta percha as formerly. A very important improvement is made by which the danger of encountering fixed obstacles in the ground is overcome in a very satisfactory manner. There is a fixed and brodd headed pin in the drag bar, and another in the locking tumbler; these are connected by a very thick gutta percha band; if therefore, the tube catches on any fixed obstacle, the band stretches and allows the tube to extend until it becomes in a line with the drag; when released from the obstacle the band draws it at once into its place. This we deem a most valuable improvement.

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D. E. McSherry & Co., Dayton, O.; the McSherry Grain Drill. Weight, 500 lbs. Price $95.

This machine has a spiral feeder, a gutta percha conductor tube, an iron lift-bar, which closes the run of the seed as soon as it is lifted; a speedometer which measures the yards passed over accurately. The rate of distribution is regulated by changes of cog wheels. The frame is made of ash and hickory, and the inclosures of basswood.

Bristol & Robbins, Oswego; Putnam's Patent Sowing Machine, for Grain, Seeds and Manures. Weight 680 lbs., four and one-half by seven and one-half feet. Price $120.

H. B. Dean and S. A. Baker, Ludlowville, Tompkins county, Grain Drill and Grass Seed Sower Combined. Weight 550 lbs., seven feet six inches wide. Price $90.

The above were all entered for premiums and a trial desired, but as no proper place could be obtained for the purpose, the competitors politely consented to waive their claims for a trial, and content themselves with such notice as is given above.

Potato diggers.

Geo. W. Kintz, Rochester, exhibited a Potato Digger which was tried in the field. It is known as the "Free and Easy," weighs 175 lbs., and sells for $50. With two horses and two men, he dug, in a distance of sixteen and one-half rods, five and one-half bushels of potatoes, which were dug in twelve minutes and picked up in forty minutes. There was no competitor in the field with him, and we therefore abstain from any expression of opinion on the merits of the machine.

Reamer & Vanderzee, of Albany, exhibited a Potato Digger, but as it was not placed on the official list of articles for trial handed to us, we did not notify them of the time of trial. They stated to us, when it was too late to try it, that they had asked for a trial at the time of entry, and expressed much regret that they had been unable to show the merits which they claimed for their machine in a practical trial. Their instrument weighs 300 lbs., is two and one-half feet wide, and its price is $60.

Stump machines.

George W. Prossey, Hammonton, N. J., C. A. Church, general agent, New Berlin, Chenango county, "Pioneer Stump Puller." Weight 300 lbs. Price $85. This machine is worked by the successive actions of two levers in each of which the applied power is multiplied sixty times. They are supported by a heavy tripod, and the successive elevations of the levers are held by a cross-bite of a socket which embraces a dependant rod from the apex of the tripod. It is a machine combining much strength and simplicity and, it is claimed, will, with the aid of three men, pull from forty to 150 stumps per day, according to the varying circumstances of different fields.

L. C. English, Corning, Steuben county; "Empire Stump Machine." Price $225.

This is a machine of great power and strength combining the agencies of wheel and axle and a succession of pulleys. The exhibitor was absent when the committee visited the machine on two different occasions, we can therefore give no farther account of it.

Plows.

Barrager & Jennings, Candor, Tioga county; Reversible Flat Land and Side Hill Plow. We had no opportunity to give the plow a practical trial. We cannot express an opinion of its merits.

J. STANTON GOULD,
Chairman of Committee.

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No. 21. STOVES, &c.

The judges in this class have not yet reported.

CLASS V—FARM PRODUCE.

No. 22. GRAIN, SEEDS, &c.

First prize white winter wheat, Lewis Fitch, Elmira, "Diehl,"	$10
Second, O. Howland, Auburn, "Wicks,"	5
First prize red winter wheat, J. S. Holbert, Chemung,	10
Second, Milton H. Ottley, Phelps	5
First prize rye, "white Michigan." H. Schoonmaker, Cedar Hill	10
Second, Edward D. Roe, Elmira	5
First prize white oats, "Probestier," *William Newton, Henrietta, N. Y.	10
Second, Guy Gray, Elmira	5
First prize black or gray oats, J. S. Holbert, Chemung	10
Second, John G. Burritt, Elmira	5
Second prize winter barley, O. Howland, Auburn	5
First prize spring barley, O. Howland, Auburn	10
Second prize timothy seed, O. Howland, Auburn	3
Second prize sorghum seed, Mrs. J. T. Van Namee, Pittstown	3
First prize seed ears yellow corn, J. S. Holbert, Chemung	5
First prize seed ears White corn, R. E. Moss, Elmira	5
First prize seed ears sweet corn, J. S. Holbert, Chemung	5
Second, R. E. Moss, Elmira	3

No. 23. VEGETABLES.

First prize celery, Geo. Chamberlain, Elmira	3
First prize cabbages (six varieties), C. W. Crosman, Rochester	3
Second, J. S. Holbert, Chemung	2
First prize lettuce, C. W. Crosman	3
Second, B. C. Trumble, Elmira	2
First prize turnips, B. C. Trumble	3
Second, C. W. Crosman	2
First prize beets, C. W. Crosman	3
First prize orange carrots, C. W. Crosman	3
Second, B. C. Trumble	2
First prize white carrots, C. W. Crosman	3
Second, B. C. Trumble	2
First prize parsnips, B. C. Trumble	3
Second, C. W. Crosman	2
First prize salsify, C. W. Crosman	3
Second, Kohl-rabi, C. W. Crosman	2
First prize onions (seven varieties), C. W. Crosman	3
Second, B. C. Trumble	2
First prize tomatoes (twelve varieties), C. W. Crosman	3
Second, B. C. Trumble	2
First prize egg plant, C. W. Crosman	3
First prize garden beans, Mrs. J. T. Van Namee, Pittstown	3
Second, C. W. Crosman	2

*Mr. Newton showed a sheaf and one stool of this variety of oats. The stool contained twenty-eight stalks, numbering 3,200 grains.

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First prize peppers, C. W. Crosman	$3
Second, Mrs. J. T. Van Namee	2
First prize squashes, C. W. Crosman	3
Second, B. C. Trumble	2
First prize pumpkins, J. S. Holbert	3
Second, H. Schoonmaker, Cedar Hill	2
First prize sweet potatoes, C. W. Crosman	3
First prize potatoes, H. Schoonmaker, Cedar Hill (ten varieties); five late sorts, viz.: "Monitor," "Peach Blow," "White Peach Blow," "California Peach Blow" and "Prince Albert;" five early sorts, "Black Diamond," "Early Goodrich," "Early Sprouts," "Early Rose," and a sort from Iowa, name unknown.	3
Second, B. C. Trumble, Elmira; seven varieties, viz.: "Early Rose," "Early Goodrich," "Early Egg," "Harison," "Chili," "Gleason," "Davis' Seedling"	2
First prize collection of vegetables (eighty-five varieties), C. W. Crosman	10

John D. Miller, Elmira, a very fine sample of Tilden tomatoes.

C. W. Crosman and H. Schoonmaker exhibited very nice samples of black winter radishes.

Mr. Solomon Bennett, of Elmira, had on exhibition only, a sheaf of Norway Oats (very nice), which attracted the attention and gratified the curiosity of many inquirers for Norway Oats; also two samples of white silver and white dent seed ears of corn.

No. 24. Flour, &c.

Messrs. Merrill & Willis, of Millport, N. Y., exhibited two barrels of fine Winter Wheat Flour, with samples of Wheat and statement accompanying the same.

One barrel was made from four bushels and thirty-nine pounds of Amber Wheat. The other from four bushels and thirty-one pounds of White Wheat. Awarded first prize, $10.

Special.

G. T. Hollingworth & Brother, of Utica, exhibited a sample of Bone Meal (very good), highly recommended for feeding to cattle, pigs and poultry.

William Crozier, of Northport, L. I., exhibited three varieties of White Oats and one of Black, one bushel each. Also one bushel of small field Peas, all very good. Not being the amount required for competition, your committee could give no award.

Hovey & Heffron, Chicago, Ill., had on exhibition a sample of Surprise Oats, weighing forty-five pounds to the bushel.

Colonel George E. Waring presented for exhibition only a sample of Tomatoes he had been some twenty years in producing, which your Committee think the best variety they ever tested, and deem them worthy of special notice.

Franklin Bowen, Orleans county, had on exhibition a small box of Chinese Flint Spring Wheat, very fine.

O. K. RICE, Greenwich, N. Y.,
C. B. WAY, Camillus, N. Y.,
Committee.

No. 25. Butter.

Butter made in June (50 pounds sample).

First prize, R. E. Moss, Elmira	$20
Second, David B. Bentley, Southport	15
Third, A. B. Benham, McLean	10

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Fifty pounds sample made at any time.

First prize, J. S. Holbert, Chemung	$20
Second, H. C. Hoffman, Horseheads	15
Third, A. R. Frost, Millport	10

Five pounds sample in rolls.

First prize, H. C. Hoffman, Horseheads	10
Second, Thomas S. Frost, Millport	5

Commended.

Miss E. J. Holbert, Chemung; 13 years; Jar of Butter, very fine, 5 pounds.

Onondaga Salt Company; W. H. Graves, agent, Elmira; 12 entries of salt, very fine article.

No. 26. CHEESE.

American cheese not less than forty pounds weight, from factory or private dairy, over one year old.

First prize, M. E. Myers, Charlton, Private Dairy	$20
Second, Clear Spring factory, Fredonia	15

Less than one year old.

First prize, Horatio Graves, Wethersfield Springs, private dairy	20
Second, M. E. Myers, Charlton, private dairy	15
Third, Clear Spring Cheese Factory, Fredonia	10

Lots of five cheeses less than one year old, not less than forty pounds each, from factory or private dairy.

First prize, M. E. Myers, Charlton, private dairy	$20
Second, Clear Spring Cheese Factory, Fredonia	15
Third, Horatio Graves, Wethersfield Springs, private dairy	10

Three factory cheeses (1869).

First prize, Clear Spring Factory, Fredonia	15
Second, Simpson Cheese Factory, New Hudson, N. Y.	10

Three cheeses private dairy (1869).

First prize, M. E. Myers, Charlton	15
Second, Horatio Graves, Wethersfield Springs	10

Cheddar cheese.

First prize, F. W. Collins, Rochester	10

Rennets.

First prize, M. E. Myers, Charlton	10
Second, F. W. Collins, Rochester	5

No. 27. BREAD, SUGAR, &C.

First prize Wheaten Bread, J. S. Holbert, Chemung	5
First prize Maple Sugar, H. Graves, Wethersfield Springs	5
Second, Mrs. R. A. Thomas, Alfred Center	3
First prize Maple Syrup, Mrs. R. A. Thomas, Alfred Center	5
First prize Honey, R. R. Moss, Elmira	5
Second, A. D. Griswold, Southport	3

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First prize Dried Apples, Mrs. W. H. Graves, Blossvale..... $5
First prize Dried Raspberries, Mrs. W. H. Graves, Blossvale..... 5
Second, John McCowan, Lockport,..... 3

Commended.

E. S. Baker, New York, Sugar Cured Hams and Bacon.

Bee-hives.

Your committee commend each of the following:

Volney Leonard, Springfield, Pa.

P. Compton, Sullivanville, Chemung county; Compton's Monitor Bee-hive for control of the bees in removing and replacing boxes; for protection from robbers; with movable bars in the boxes, with which the honey can be lifted out.

J. H. Graves, Rochester.

JAS. H. GRAHAM, Delhi, N. Y.,
HARRIS LEWIS, Frankfort, N. Y.,
Committee.

No. 28. WINES, &c.

Pleasant Valley Wine Company, Hammondsport; for excellence in Wines generally.....Silver Medal.
Urbana Wine Company, Hammondsport, N. Y.; for excellence in Wines generally.....Silver Medal.
Christian Hauser, Rochester; for specimen Wines of German character. Silver Medal.
First prize Cider Vinegar, J. S. Holbert, Chemung..... $5
Second, Mrs. W. H. Graves, Blossvale..... 3

The above are our awards after an elaborate and critical examination of the various specimens presented to us, in which we mark a decided progress in the manufacture of our Domestic Wines from the native grape.

LEWIS F. ALLEN, Black Rock,
ALEXANDER THOMPSON, Aurora,
JOHN A. KING, Great Neck,
Committee.

No. 29. DOMESTIC MANUFACTURES.

First prize ten yards Woolen Cloth, Charles Evans, Southport..... $5
First prize ten yards Woolen Flannel, Mrs. W. H. Graves, Blossvale..... 5
Second, M. and F. Hayden, Sandusky..... 3
First prize ten yards Flannel, cotton warp, Mrs. W. H. Graves 5
First prize ten yards Linsey Woolsey, Mrs. W. H. Graves..... 5
First prize ten yards Woolen Carpet, Mrs. S. M. Fassett, Fassett, Pa..... 5
Second prize ten yards Rag Carpet, Mrs. J. T. Van Namee, Pittstown..... 3
Second prize Carpet Coverlet, Mrs. W. H. Graves..... 3
Second prize ten yards Linen Cloth, Mrs. W. H. Graves..... 3
First prize knit Bed Spread, Jas. S. French, Elmira..... 3
Second, Nancy Rockwell, Elmira..... 2
First prize Quilted Bed Spread, Mrs. Henry Seeley, Elmira..... 3
Second, Miss Laura Hathorn, Elmira..... 2
Second prize Woolen Knit Stockings, Mrs. W. H. Graves, Blossvale 2
Second prize Woolen Knit Socks (by girl under twelve years), Mrs. W. H. Graves, Blossvale..... 2

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Second prize Woolen Knit Mittens, Mrs. J. T. Van Namee, Pittstown $2
First prize sample Woolen Yarn (by girl under twelve years), Mrs. W. H. Graves, Blossvale 3
First prize 1 lb. Linen Thread, Mrs. W. H. Graves 3

Extra prizes.

10 yards Woolen Cassimere, Chas. Evans, Southport 5
Coverlet, La Fayette Pattern, Mrs. A. Booth, Elmira 2
Patchwork Quilt (made by a blind girl), Miss Laura Hathorn, Elmira 2
Patchwork Silk Quilt, containing 13,124 pieces, Mrs. Laura Gregory, Caton Center 3
Hemp Dusters, price 75c., $1, $1.25, Miss S. S. Eddy, Elmira 3
Affghan for Carriage, Mrs. O. C. Dounce, Elmira 2
Affghan, Mrs. Joel I. Hoyt, Jamestown 3
Tidy for Chair, and Tatting Collar, Mrs. W. L. Stryker, Elmira 3
Worsted Knit Tidy for Chair, Mrs. Sarah Miller, Elmira 3
Worsted Tidy, Nancy Rockwell, Elmira 2
Tatting Cake Tidy, Tatting Chair Tidy, Chemise Yoke and Sample of Tatting, Hannah Rockwell, Elmira 3
White Embroidered Skirt, Miss Minnie Hall, Elmira 2
Cone Card Receiver, pair Cone Vases, pair Cone Wall Baskets, Shell Wreath and Frame, Shell Card Receiver, Shell Vase, Mrs. R. A. Thomas, Alfred Center 3
Case Shell Work, Jas. S. French, Elmira 2
Wax Work, Flowers and Vine, Miss Nellie W. Jones, Elmira 2
Cased Bouquet White Feather Flowers, Miss Kitty A. Moody, Big Flats 2

JOSEPH E. ELY, Binghamton,
W. H. WATSON, Medina,
EDWARD HARPER, Harpersville,
SAMUEL O. DEAN, Deposit,
Committee.

CLASS VI.—FLOWERS AND FRUITS.

No. 30. FLOWERS—PROFESSIONAL LIST.

Cut flowers.

First prize, James Vick, Rochester $10
Second, Mrs. Sarah Humphrey, Elmira ..... S. S. Medal.

Dahlias.

First prize (collection), Ellwanger & Barry, Rochester 6
Second, James Vick, Rochester 3
First prize twenty-four dissimilar flowers, Ellwanger & Barry 5
Second, James Vick 3
First prize twelve dissimilar flowers, Ellwanger & Barry 3
Second, James Vick 1

Roses.

First prize (collection), Ellwanger & Barry 6
Second, Mrs. Sarah Humphrey, Elmira 3
First prize twenty-four, Ellwanger & Barry 5
First prize twelve, Ellwanger & Barry 3

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Carnations.

First prize, Mrs. Sarah Humphrey $3

Phloxes.

First prize collection annual, James Vick..... 5
First prize twelve annual, James Vick 3
First prize collection perennial, Ellwanger and Barry 5
First prize twelve perennial, Ellwanger & Barry 3
First prize new seedling (annual), James Vick 1

Verbenas.

First prize (collection), Mrs. Sarah Humphrey 5
Second, Ellwanger & Barry..... 3
First prize seedlings, James Vick 1

Asters.

First prize (collection), James Vick..... 3

Pansies.

First prize (collection) James Vick 3

Ten week stocks.

First prize (collection), James Vick 3

Gladiolus.

First prize (collection), James Vick 3
Second, Ellwanger & Barry 5

Commended.

American Seedling Gladiolus, a very choice collection, James Vick.

No. 31. FLOWERS—AMATEUR LIST.

Cut Flowers.

First prize, Mrs. J. T. Van Namee, Pittstown $10

Dahlias.

First prize (collection), C. W. Crosman, Rochester..... 5
Second, Mrs. J. T. Van Namee..... 3
First prize twelve dissimilar flowers, C. W. Crosman 3
Second, Mrs. J. T. Van Namee 1
First prize six dissimilar flowers, C. W. Crosman 2
Second, Mrs. J. T. Van Namee..... 1

Roses.

First prize twelve varieties, Mrs. J. T. Van Namee 3

Carnations.

First prize (collection), Mrs. J. T. Van Namee 3

Verbenas.

First prize (collection), Mrs. J. T. Van Namee.. 5
Second, C. W. Crosman..... 3

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First prize twelve varieties, Mrs. J. T. Van Namee	$3
First prize six varieties, Mrs. J. T. Van Namee	2
First prize new seedling, Mrs. J. T. Van Namee	1

Annual phloxes.

First prize (collection), C. W. Crosman	5
Second, Mrs. J. T. Van Namee	2
First prize one variety, C. W. Crosman	2
First prize six perennial, Mrs. J. T. Van Namee	2
First prize new seedling, Mrs. J. T. Van Namee	1

German asters.

First prize (collection), C. W. Crosman	3
Second, Mrs. J. T. Van Namee	1

Pansies.

First prize (collection), Mrs. J. T. Van Namee	3

Everlasting flowers.

First prize, Mrs. R. A. Thomas, Alfred Center	3
Second, Mrs. J. T. Van Namee	1

No. 32. FLOWERS—GENERAL COMPETITION.

House plants.

First prize (collection, twenty varieties), Mrs. Sarah Humphrey, Elmira	10
Second, George Evender, Elmira	5

Floral designs or ornaments.

First prize, Mrs. Sarah Humphrey	5
Second, Mrs. J. T. Van Namee	3

Special.

Everlasting wreaths, Mrs. R. A. Thomas, Alfred Center	5

Hand bouquets.

First prize, Ellwanger & Barry	5
Second, George Evender, Elmira	3

Parlor bouquets.

First prize, Ellwanger & Barry	5
Second, George Evender	3

Basket bouquets

First prize, Mrs. Sarah Humphrey	5
Second, George Evender	3

Newly introduced flowers.

First prize, James Vick	5

Special.

John T. Miller, for a very fine dwarf coxcomb	3

C. ALLEN, Brooklyn,
A. WHITNEY, Brooklyn,
Committee.

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No. 33. Fruits—Professional List.

Apples.

First prize collection forty varieties, Ellwanger & Barry $15

Commended.

E. C. Frost, Watkins; plate of "Tompkins' County King" apples.
E. C. Frost, Watkins; seedling apple (a beautiful and desirable fall variety).

Pears.

First prize twenty varieties, Ellwanger & Barry..... 15
First prize fifteen varieties, Ellwanger & Barry 10

Commended.

Ellwanger & Barry, Plums; exhibited after the awards were made.

Grapes.

First prize greatest number of varieties good native Grapes, J. W. Clark, Naples, Ontario county..... 6
First prize best specimens of good native Grapes, Pleasant Valley Wine Company, Hammondsport, N. Y..... 6
First prize one variety "Eumelan," Hasbrouck & Bushnell, Iona, near Peekskill 2

Commended.

I. C. Cook, Ithaca, N. Y.; "Wyoming Red" (on exhibition only). It is very early and pleasant flavor; well suited to places where other varieties fail to grow.

No. 34. Fruits—Amateur List.

Apples.

First prize twenty varieties, George C. Wickham, Havana $12
Second, James R. Conklin, Elmira..... 8
First prize fifteen varieties, Robert Bell, West Brighton 10
Second, James R. Conklin..... 5
First prize ten varieties, James R. Conklin 5
Second, Robert Bell..... 3

Special.

Ten varieties apples, Milton H. Otley, Phelps.....Transactions.

Pears.

First prize fifteen varieties, Robert Bell, West Brighton 12
Second, John H. Bell, West Brighton..... 8
First prize ten varieties, Robert Bell 10
Second, John H. Bell..... 5
First prize six varieties, Robert Bell 8
Second, John H. Bell... 4

Peaches.

Second prize ten varieties, George C, Wickham, Havana..... 3

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Plums.

First prize, one variety, C. W. Crosman, Rochester..... $1

Quinces.

Robert Bell, West Brighton..... .....Transactions.

The committee on Class VI (Fruits), respectfully report,

That in their opinion the exhibition of fruits is not fully a fair representation of the existing fruit crop of the State of New York, and that the competitors are fewer than might have been expected. To account for this several causes have been named.

1st. The fact that all fruits are late in ripening, at least two weeks, and in some kinds more than that period. Yet we commend those who have exhibited, and their interest in the matter.

2d. That at the early period at which the entries were closed it was impossible to form an opinion whether it was desirable to exhibit, or what to show.

3d. Doubtless a later period than this, could this have been foreseen, say the 28th to the 30th of the month, would have ripened and colored fruit so as to make it more desirable to put it on the Society's tables.

JOHN SLOAN, Albany,
S. J. PARKER, M. D., Ithaca,
Committee.

CLASS VII—MISCELLANEOUS.

The articles entered in this department were examined by the Judges of Class V, Committee 29, who report the following articles as worthy of favorable notice and commendation:

P. B. Hawse, Clothes Dryer and Horse.

James Pyle, New York; Pyle's O. K. Soap, Pyle's O. K. Saleratus, Pyle's Blueing Powder and Pyle's Soda.

E. Morgan's Sons, New York, Family Soap for laundry purposes; "Sapolio," for cleansing and polishing metals.

A. M. Lesley, 605 Sixth avenue, New York, Refrigerator, $50; Wine and Milk Cooler, $30.

S. & D. B. Wheat, Middletown, Orange county, Alaska Refrigerator and Provision Safe combined.

H. D. Straus, Elmira, Iron Spring Bed Bottom, $10.

Genung & Ifler, Waterloo, Extension Table Slide.

Nathan Stockwell, Ouaquaga, Broome county, Improved Combined Table and Workstand.

Charles Fritz, Elmira, Window Curtain Fixtures, Fritz's patent.

E. B. Hungerford, Corning, Steuben county, Set Glass Window Blinds for inside shutters, made in form of wooden blinds.

American Lock Company, Cazenovia, Felter's Patent Locks.

G. W. Hildreth & Co., Lockport; exhibition of School Furniture.

L. B. Powell, Scranton, Pa.; exhibition of Pianos and Cabinet Organs.

Arthur Westcott, Elmira; Piano (Chickerings).

J. Greene, Elmira; Piano.

Reddington & Howe, Syracuse; Piano with Organ Attachment, and Combination Organ.

Schreiber Cornet Company, Henry C. Vail, secretary, 680 Broadway, N. Y.; New American Cornets and Band Instruments.

D. W. Denton, Ithaca; Cement Roofing.

J. Campbell, Troy, Pa.; Patent Tanning and samples Fancy Wool Work.

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Elmira Seamless Keg Company, Elmira; O. D. Goodsell, secretary; Seamless Kegs.
C. O. Gott, Syracuse; Photographs and Oil Paintings.
G. W. Parker, Owego; Penmanship.

J. E. ELY, Binghamton,
W. H. WATSON, Medina,
EDWARD HARPER, Harpersville
SAMUEL O. DEAN, Deposit,
Committee.

REPORT OF SPECIAL COMMITTEE

On the Threshing Machine entered by Wheeler, Melick & Co., Albany, N. Y., for the premium offered for any improvement in Threshing Machines, if judged of real permanent value, and invented or introduced since the trial in 1866, at Auburn.

Wheeler, Melick & Co., Albany, Thrasher and Cleaner, for 10 horse-power; Geiser patent of 1868. Entry No. 996.

We made a thorough examination and trial of this machine and found that it thrashed at the rate of one bushel in forty-five seconds; a careful and protracted examination failed to show a single kernel of wheat left in any of the heads, nor did we find any waste grain whatever.

The cleaning was as good as could be desired, except that the small seeds contained in the grain were not taken out; but this may be remedied by passing it over a screen which would allow them to fall through before the grain is spouted into the measure. We were informed that they put these screens on to machines sold by them when it was desired by the purchaser.

This machine presents the following peculiarities of construction:

1st. There is no apron or sieve on, or in the machine, the chaff and grain being carried over rollers on a downward grade, while a gentle blast is blown which separates the chaff and cleans the grain effectually without waste.

2d. This blast is regulated by a strictly automatic arrangement which acts admirably, and renders the overloading of the fan an absolute impossibility.

3d. None of the separating machinery is driven from the cylinder, but is perfectly independent of it.

4th. The number of bushels of grain thrashed by the machine is counted with unerring accuracy by means of a very ingenious self-registering apparatus.

5th. The concave can be raised or lowered by the person who feeds the machine, while it is in motion. We were very much pleased with this arrangement, which, so far as we are aware, is not found on any other machine.

We are inclined to attribute superiority to this machine for the following reasons:

1st. The rapidity and excellence of its work.

2d. The superiority of its duration. We found our opinion upon this point upon the entire absence of lateral vibration in this machine, which in all others that we have been acquainted with is a very disturbing element, and which wears upon every joint of the machine, and especially upon the gearing. We could detect no vibration in this except in a horizontal direction, which was slight and not objectionable.

3d. We esteem the arrangement for counting the number of bushels thrashed as an admirable guard against errors, and as adding greatly to its value.

4th The automatic regulation of the blast is, in our judgment, a point of great excellence.

In view of these valuable improvements we award the large bronze medal of the Society.

HENRY WATERMAN,
JOHN STANTON GOULD,
Committee.

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TWENTY-NINTH ANNUAL FAIR OF THE NEW YORK STATE AGRICULTURAL SOCIETY AT ELMIRA.

The visit of the Society to Elmira has been a pleasant one. Twice before had the State Fair been held at this thriving town, and each time heavy rains interfered with the enjoyment of the occasion. This year, however, the splendid weather gave an opportunity of seeing to advantage the beauty of the valley in which Elmira (risen to the rank of a city since the fair of 1860) is so cosily nestled, and the week which the Society had been compelled to select turned out the best in the whole autumn. A little warm perhaps it was, and a trifle dusty, but heat (especially with the cool mornings and pleasant breezes that we had) and dust are easier to bear than cold and rain.

The grounds, though small and requiring a somewhat compact arrangement of the show, were found sufficient, and indeed it was a subject of remark that though on the second day of the Fair the number of tickets showed that about 25,000 persons must have been present, there was no discomfort from overcrowding in any part of the ground. The supply of water was at one time far from adequate. Dependence had been placed upon the supply from the main pipe of the city water works, which passes through the ground occupied, but the long continued drought had reduced the reservoir so much that it came near failing altogether. The difficulty was remedied (upon the kind suggestion and with the aid of Mr. W. P. Sherman, the chief of the fire department) by using one of the fine steam fire engines belonging to the city, to pump the water after the pressure from the resorvoir proved insufficient.

The influx of visitors taxed to the utmost the capacity of the city, but the people of Elmira proved equal to the emergency, and it is believed that all were comfortably lodged during the Fair. The headquarters of the Society were at the Rathbun House, where the host, Mr. Wadsworth, showed himself a landlord of resources, as well as a courteous and attentive one.

The Society was favored with the presence of the Honorable the Commissioner of Agriculture and Mr. Glover, of the Agricultural Department, early in the exhibition. The President of the Agricultural Association of Ontario and the President of the State Society of Pennsylvania were also present, with other representatives of both Societies.

His Excellency the Governor paid a visit to the Fair on the last day, and it was much regretted that he was not able to come while the exhibition had more attractions.

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Of the exhibition it may fairly be said that while it was not, as a whole, equal to Fairs the Society has held, it was nevertheless very respectable, and in several departments brought out evidences of special progress. There were several drawbacks. Two breeders of cattle and several breeders of sheep, who had made large entries, were for some reason or other absent. One of them, Captain Hilton, was taken ill suddenly just before the fair. The absence of the others has not been accounted for. One gentleman (Mr. Coleman, of Seneca), whose entry of horses would have added to the unusually good show in that department, was prevented attending by a death in his family. A number of articles sent by railroad were unaccountably detained on the way and did not arrive in time to be exhibited (in one case three car loads of implements were so detained), and finally the character of the season had been such as to prevent a good show of fruits and flowers. Besides, it is to be considered that when the Society appoints its exhibition at a place off the line of the Central railroad it is always to some extent a sacrifice, made, to be sure, voluntarily and without regret, from a sense of the duty of diffusing the benefits of its operations, but yet a sacrifice always felt both in the extent of the display and in the receipts of the fair.

The show of cattle, notwithstanding the deficiency of the number shown compared with the number entered, was an exceedingly good one. Of this department, Mr. Swan, the member of the Executive Committee in charge of it, writes as follows:

"The show in this department was not as large as we had been led to anticipate from the number of entries made by prominent breeders in the eastern part of the State, which, for some cause, they failed to make good. The show of short-horns was small, but good from the quality of the animals on exhibition. Besides, the stock shown by the Hon. Ezra Cornell, of Ithaca (to whom the herd prize was awarded), and by Mr. George Butts, of Manlius, Messrs. William Blanchard, Ira Young, V. W. Mason, and William Jackson, had fine specimens of aged bulls, and Messrs. J. W. and C. W. Wadsworth some fine animals in the younger divisions. The Devons were not out in large numbers, but a good show was made, especially by Mr. Walter Cole, of Batavia, who took the herd prize. Of Ayrshires there was a very excellent show, the principal exhibitors being Messrs. Walcott & Campbell, of New York Mills, and Mr. S. D. Hungerford, of Adams, the herd prize going to the former. Of Jerseys, there were few compared with the number in the catalogue, and great disappointment was expressed at the absence of the entries of

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Mr. W. B. Dinsmore. Mr. Wm. Crozier, of Northport, L. I., made a good display in this class, and was awarded the herd prize. There were no entries of Herefords, but a very respectable show in the classes of grades and fat cattle."

It should perhaps be added that the short horns of Mr. Cornell were fully up to the high standard his herd has attained, and that the show made by Mr. Butts, who had not been an exhibitor for several years, was of remarkable excellence. It possessed an interest, moreover, from showing how great good can be done by a single animal of pure and high descent, and proved Mr. Butts to be a breeder of intelligence and skill, so that it deserves a few words of notice in this place. Beginning with a good foundation, but with animals of pedigrees considered "old fashioned" (though their value is now beginning to be duly appreciated), a Countess of the strain so long bred by Lewis F. Allen, and a Pansey of the Van Rensselaer importation, Mr. Butts had bred in the same lines until his purchase, about 1858, of the pure Bates bull, Apricot's Gloster (2,500), son of the famous Duke of Gloster (11,382) and the imported cow Apricot, by 3d Duke of York (10,166). This bull was (as he stood on the fair ground of Watertown, in 1861, winner of the first prize in his class) worthy of his descent, of a beautiful red color, of very remarkable quality, symmetry and compactness, short in leg, good in chest and crops, very level and deep, of good carriage, and with a very beautiful head, well set (not high) on a short and well formed neck. But what was more to the purpose he proved to be (even for one of Duke of Gloster's sons) a remarkably powerful sire, and his owner had the sense and judgment to continue using him while he lived, the result being a herd of which any breeder might well be proud.

Of the animals shown by Mr. Butts, Treble Gloster, two years old, and the successor of his progenitor in the herd, is a red bull, of good size and apparently capital constitution, in quality and form very much resembling the old bull, though longer. He is by Apricot's Gloster, dam by the same, grand dam by the same, so that his name is justified by his pedigree. His dam, Spring Beauty, is also red, and is a cow of great neatness and very attractive in every way, and the red heifer calf by her side, Souvenir by Treble Gloster, is a little gem, as promising as could be wished. None of these inbred cattle show the slightest deficiency of substance or constitution, quite the contrary. They are shown in natural condition and are eminently useful looking beasts. It is not intended, in these remarks, to convey the idea that inbreeding can be carried on *forever* without a check,

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but to enforce the truths so well set forth by Mr. Allen in his prefatory essay to the first volume of the American Herd Book, when he says:

"To such as intend to breed cattle of decided excellence, we recommend to select bulls of only moderate size, coupled with all the fineness of bone and limb consistent with a proper masculine vigor and energy, and with fullness of carcase and ripeness of points, so as to embody great substance within small compass. *In addition to this let him be deeply bred, that is of as pure blood and of as long ancestry (not depending altogether on the herd book for that, as many of the best class of animals have comparatively short herd book pedigrees) as possible.* * * * Your cows, we will presume, are such as your opportunities have enabled you to procure, but of approved blood. *If the bull selected breed well to your cows, have no fears of continuing his services to a second or even a third generation of his own get.* Such practice will produce uniformity, and uniformity is one great excellence. No matter for the color, so that it be within the short-horn colors."

In the Devon class the credit of this hardy and beautiful sort was well maintained by Mr. Cole, who was, however, disappointed by the absence of his usual rival; but in the Ayrshires the lovers of this excellent dairy breed were gratified by seeing the two best herds in the State, both fully represented, in competition; and it was a pleasure to welcome Mr. Hungerford again as an exhibitor. In the absence of Mr. Dinsmore, the Jersey honors were carried by the Beacon Farm herd of which a capital entry was made, and the Herefords did not put in an appearance at all.

The show of horses was an exceedingly good one in the division of breeding stock, but only respectable in the class of harness horses, although of single harness horses there was a good entry. The class of stallions for general purposes was one of the strongest and best ever exhibited at the fairs of this Society. The class of road stallions was also very good, and the show of young stock was a large and very creditable one, the large entry made by Mr. Morris being a very prominent feature of it.

Upon the declaration of the awards of the horse premiums, the new classification of horses, adopted in 1868 and continued this year, was made the subject of some criticism, on the ground that it was unfair to compel horses of mixed or unknown blood to compete with thorough-breds.

The changes made in 1868, in the list of premiums offered for

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horses, consisted in giving up the special or separate class for thorough breds, thus throwing them into the class of horses for general purposes, and in likewise giving up the special class for horses of the Morgan and Black Hawk breeds. With the latter change no one is likely to find fault, for these breeds (if they ever were breeds in the strict sense of the word) are no longer much cultivated in any purity, and besides if they were not *horses for general purposes*, to which class they are now remitted, they were nothing. Granting that the Morgans and Black Hawks possessed all the qualities their admirers (with a good deal of justice) claimed for them, their proper place was always in this class. A third change in the list was the addition of premiums for stallions for getting roadsters. This addition seemed to be a necessary one, it has called out a very excellent exhibition and is believed to be generally approved.

The question then is reduced to this, should the thorough-bred horse be allowed to compete in the class of horses for general purposes or should he not? It is believed that the question cannot be answered in the negative without necessitating the admission that the present classification is radically wrong throughout, as being based upon the use to which the animal is adapted instead of upon his breeding.

In the former list (previous to 1868) the classification of the horses was a mixed one, two breeds being allotted each a list of prizes to itself, and the rest of the prizes being arranged according to the uses of the animals. The facts were that under this arrangement neither thorough-breds nor Morgans made any show to speak of. Occasionally a weedy thorough-bred or two would be shown, and the blood horse was often the subject of contemptuous remarks by men who had never seen him in perfection.

The classification of horses in our prize list—by their uses instead of by their breeds—seems to be the only practicable and sensible one for us to adopt, not only because the character of our agriculture is such that our needs call imperatively for horses that can plow, do our teaming and draw our wagons and carriages to mill, to church and to market, and which, besides this, shall be active enough, big enough and handsome enough to sell for good prices when they arrive at maturity; these qualifications ensuring, at the same time, that, if by accident, they become unfit for market, they can still (unless entirely disabled) be profitably kept to wear out upon the farm or in the team; but because our people do not cultivate distinct breeds of horses, nor, as a rule, breed horses with any

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system, so that if we should adopt the classification by breeds, very few of the classes would ever show a respectable entry, nor would the prizes serve any useful purpose.

If then we are to arrange our list with reference to the uses to which the animals are adapted, is it reasonable to exclude any horse from competition for a prize on account of his race or descent? It would seem that, under such a classification, the question should be, "What is the horse good for?" not "How is he bred?" It has been always admitted that the English thorough-bred horse possesses great activity and endurance, great massiveness (or specific gravity) of bone, strength of sinew and great proportionate development of the organs of respiration and circulation. It is also long since admitted that he possesses the power of imparting largely of these qualities to his produce by cold-blooded mares. The history of the horse in all civilized countries proves that an infusion of English or eastern blood has, in these points at least, improved every race of horses upon which the experiment has been tried.

It is submitted that the not recognizing these facts has been a great hindrance to the improvement of the horses of New York and the other northern States. If the award of prizes at our Fairs shall prove that the thorough-bred, or highly bred horse, in addition to the qualities he is admitted to have, possesses others that, with them, constitute him the best horse for general purposes, that is to say, the horse we want and the best horse for us to have, our Fairs will then have established a fact of real value and usefulness. The light, weedy thorough-bred horse, bred so as to spoil him for everything but short races at high speed (if he retains even that merit), will never have any chance in our class of horses for general purposes; but when the thorough-bred horse has the size, the shape and the action that make him the best horse for general purposes (and the experience of this year shows that we have such), his pedigree guarantees his power to impart those qualities and characteristics to his produce, and renders him yet more useful as a sire.

The show of sheep requires little remark. It was smaller than was expected, as several Cotswold breeders who made entries did not send their stock; but no division was entirely blank, and the pure-bred sheep exhibited were generally first class. The Leicesters had specimens from the excellent flocks of Walcott and Campbell, and Jurian Winne; the Cotswolds of the Mapleshade flock made a capital show; Walcott and Campbell exhibited their Lincolns. The Southdowns were represented by several entries, from the flock of Mr.

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Cornell, whose quality called out very general expressions of approval. Of Merinos, Mr. Chamberlain made his usual excellent show in the A division; and division B was perhaps the best filled of all the classes of sheep, Messrs. Bronson & Marriner, of Ontario county, P. and G. F. Martin, of Monroe, and Charles Stone, of Ontario, being the most prominent exhibitors. Of swine there was the usual excellent show of large hogs, perhaps less fat than heretofore, by the Jefferson county breeders, and Mr. Joseph Harris made a capital entry with his Essex.

The poultry made perhaps the most successful portion of the exhibition. Most of the prominent breeders were large exhibitors, and the show was never larger nor better. Of the arrangements in this department, Mr. John Haven, who in the absence of Vice-President Winne, kindly consented to take charge of it, and conducted it with great efficiency, writes as follows:

"The Society ought to own its own coops, of uniform size, suited to show poultry in; and let exhibitors bring their stock in whatever they find most convenient and as compact as possible; put them in the prepared coops during the exhibition, and carry them home as they brought them. There is no more reason that exhibitors of poultry should be obliged to furnish exhibition coops, than owners of swine and sheep to furnish exhibition pens.

"Scales should be provided for the use of the judges, as weight is an important point with many birds.

"Another season this department can be arranged rather more advantageously for exhibitors and the public."

Undoubtedly a much prettier show would be made if the Society should undertake to supply neat coops of uniform size and pattern; but the question is, as in the case of many other wished-for improvements, whether the Society can afford the necessary outlay, which would not be less than $1,000.

With regard to the exhibition of machinery and implements (Class IV) and of farm produce (Clsss V), it will suffice to refer to the reports of the judges and to the yery judicious observations contained in the reports which follow.

MACHINERY AND IMPLEMENTS.

The exhibition in this department was, under the circumstances, a good one, although owing to delays on the railroads many articles did not reach the Fair at all. The show of mowing and reaping machines was as usual, very fine, as was also the case with plows, horse rakes

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and drills. The display of stoves was unprecedently large and interesting. The exhibition of machinery in motion was far below former years, and I would recommend more perfect notice being given to exhibitors that power will be furnished, and that those requiring power so state when making their entries.

JAMES GEDDES,
Executive officer in charge.

Grain and Vegetables.

I submit the following, in relation to the department of the exhibition just closed, that came under my immediate supervision.

The new regulation of the Society requiring all entries to be made three weeks prior to the opening of the exhibition, operated no more disadvantageously in any department than in that of farm products.

The past season has been unusually backward, and the weather, in many portions of the State, unfavorable to the early growth and ripening of the products of the soil; consequently, many would-be exhibitors in Nos. 22 and 23, were not prepared in the middle of August to decide upon the propriety of becoming exhibitors.

Of this, abundant evidence was had in the innumerable regrets made us by tillers of the soil, that they had not completed their entries, as previously contemplated.

Tardiness of the season precluded entirely the idea of any consideration or even fair exhibition of Indian corn. So of buckwheat and potatoes; and in many portions of the State farmers were, at the time of the fair, still engaged in harvesting their oats and flax.

Many persons having made their entries at the proper time, by some miscalculation or otherwise in the matter of transportation, were unable to get their products on exhibition; and many also, with fine collections and samples of grain and vegetables, presented themselves at the opening of the fair, asking admission as competitors for the Society's awards, alleging ignorance of the regulation above mentioned.

In strictly enforcing the rule, we have been deprived of what would have largely enhanced the interest and variety of this department of the exhibition.

Still, as a whole in the quality of its exhibition, in its influences, in the information scattered broadcast by the social interchange of knowledge among the farmers that gathered around its boards, this department has been a success.

The Society, in its later action, having more vigorously scrutinized

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the claims of competitors and their exhibitions in this department, is encouraging and bringing within its influence a class of farmers of whom any society may well be proud. Of such, were it proper in this connection, it would be pleasant to give the names of a score or two.

A continuance of this policy will largely add to the number of this class of exhibitors, combining increasing strength with interest and friendship; and ere long the hall devoted to farm produce will be the central point of our exhibitions.

To the furtherance of this end I suggest, if thought advisable by those having the interests of the Society in charge, an enlargement of the appropriation to this department, and its recognition by the Society, in a measure commensurate with its importance; for really a successful tillage is necessary to the development of all the departments of agriculture and the arts recognized by this Society.

MILO INGALSBE,
Executive Officer in charge.

DAIRY.

The undersigned, in charge of this department, would respectfully report:

The exhibition of butter and cheese was not large, but most of the specimens were of good quality. As the Fair was located in a section of the State where the dairy interests have not been much developed, probably we could not expect an extensive show of dairy products.* One fact, however, was manifest, that soils and counties not hitherto known for the production of butter and cheese can be made to yield a superior article, Saratoga county having taken the prize for two successive years, and that the entire State of New York is peculiarly adapted to this purpose. Success is not so much a question of soil as climate. Some of the butter exhibited, put up in large crocks and tubs, was partially spoiled, which leads me to suggest to the butter makers of the State more care in skimming milk and packing. Too much sour milk is often mixed with the cream, which causes rancidness. This, with the sudden changes and extreme temperature to which butter is subjected, is, no doubt, the fruitful cause of so much poor butter, and therefore of great losses to farmers. Fully two-thirds of all the butter going to market is affected, and sells at a depreciated price. It is generally the case that the bottom of tubs

* Mr. Curtis here hardly does justice to Chemung and the adjoining counties of the southern tier —*Sec.*

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of butter is the poorest, giving rise to the suspicion of fraud, when the fact is that in packing the successive layers are more exposed to the atmosphere than the top of the firkin, which is carefully covered with salt when filled. The system of preparing and marketing butter in warm weather in this State can be improved. The butter is injured in packing, and being sent forward in ice cars, is subjected to a low temperature, and then unloaded and carried to the market probably in a broiling sun, which sudden and violent change is enough of itself to ruin the best article. Families in hot weather buy a few pounds at a time, which in turn is again exposed, together with that remaining in the firkin. No wonder nearly all butter is in a spoiling state when it reaches the table of the consumer. In Pennsylvania a better practice prevails. The butter is made into pound rolls, nicely stamped and packed in tin pails with a reservoir in the bottom and on the top, filled with ice, the whole then packed in a wooden tub with a close fitting cover. In this way the butter can be kept at nearly an even temperature, and retailed to the consumer in a fresh and excellent condition, netting the producer from at least forty to fifty per cent more than by the system of whole firkins and ice cars, as we have stated. A considerable quantity of butter contains the elements of decay or decomposition, which are infused into the milk by the cow eating weeds and drinking impure water; hence too much care cannot be taken to purify the pastures. The same remarks will apply to milk designed for the manufacture of cheese, as bad milk will make bad cheese. But little cheese is consumed in this country as compared with Great Britain. In the latter it is made an important article of food. Here it is used as a relish or an appetizer; our own people generally having a taste for rank or strong cheese, a little of which goes a great way. The Englishman prefers a mild cheese, a considerable quantity of which can be eaten without detriment to the stomach, as is not the case with strong cheese. The former can be preserved much longer, and being healthier, it is apparent our tastes should be changed on our own account and for the benefit of the dairymen. Makers should strive for a more even standard in the manufacture of cheese, and to help obtain this desirable end, I would recommend to the Society to establish a scale of points requiring uniformity, and establishing a degree in color, size, condition and taste, upon which to award the premiums. Until this plan prevails and our dairy maids give up over-dosing the cheese vat with so much rennet to hurry up the curd, and get the cheese out of the way, we must expect a large per cent of inferior cheese and loss to the makers.

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Smaller cheeses are required for home use, so that the last end may be used up before it spoils. An important improvement can be made in cheese houses. They should be lined on the inside to keep out the heat and to enable the dairyman to graduate the temperature, so that it may be kept if possible at a uniform degree. With greater care in the manufacture and a standard of uniformity, we shall increase the number of consumers, and place the making of cheese upon a more perfect and permanent basis.

FRANK D. CURTIS,
Executive officer in charge.

Of the show of fruits and flowers (in which department it is but just to say that Col. Frost made the most of the limited resources at his command), Vice-President Angel reports as follows:

FRUITS AND FLOWERS.

Several causes combined to make this department somewhat less attractive than it was last year. It will be remembered that the Fair last year was held in the very center of one of the best fruit and floral regions of the State, in the immediate vicinity of extensive nurseries, highly cultivated gardens and well stocked green houses; and, besides, the early period at which the Fair is held this year prevents any very considerable show of fruits. The early closing of the entry books is another reason, suggested by many cultivators from other parts of the State. This is especially true in regard to grapes.

In the floral department, however, the display was much better than could reasonably have been expected. The large tent was very artistically arranged, under the immediate superintendence of Col. E. C. Frost, of Watkins, and all who visited the exhibition will bear testimony to the taste and order which prevailed in this department. Nor should we omit to mention that Mrs. Humphrey, of Elmira, contributed essentially to the display, by sending many beautiful specimens of hot-house plants from her valuable collection, which were arranged under the canvas with much skill and taste.

From the experience of this year, it is submitted whether an exception as to the time of closing the entry books might not be profitably made for this department.

B. F. ANGEL,
Executive officer in charge.

The publication of the awards should not be made without an expression on behalf of the Society of the thanks due to the gentle-

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men who served as judges. The duty, often embarrassing and occasionally unpleasant, devolved upon the judges at our Fairs, is of the highest responsibility; since so far as the awards are not rightly made, so far the teachings of the exhibition are injurious and false. That the prizes have been given this year with discretion and impartiality, is testified by the almost unanimous approval of both exhibitors and visitors.

The thanks of the Society are rendered also to Messrs. Hubbell, Rowland and Bell, the contractors for the buildings, for the alacrity with which they performed all that was required of them by their agreement.

The address, delivered on the Tuesday evening, by Professor Buckland was a well considered and valuable essay, and was received with hearty approval. The discussions on the Wednesday and Thursday evenings were well attended, and thanks are due to Mr. Harris, of Moreton Farm, Rochester; and Mr. Lewis of Herkimer county, for their kindness in accepting, and the ability with which they performed the duty of opening their respective subjects.

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EVENING DISCUSSIONS AT THE STATE FAIR.

CAPITAL IN FARMING.

CAPITAL EXPENDED ON CLEANING AND UNDERDRAINING THE LAND—ON THE REMOVAL OF STONES—ON IMPROVED STOCK—WHEREIN THE IMPOVEMENT OF STOCK CONSISTS, AND THE NECESSITY OF BEGINNING WITH IMPROVEMENT OF THE LAND—CAPITAL INVESTED IN IMPLEMENTS AND MACHINES AND TEAMS—LOSS FROM THEIR IMPERFECTIONS OR INABILITY.

On Wednesday evening the subject of discussion was: "In what way and to what extent can farmers invest more capital to advantage on their farms?"

Joseph Harris, of Rochester, opened the discussion. After a few preliminary remarks he said that it seemed to him that we *could use capital to advantage in killing weeds.* Capital enables us to wait some time for the returns from our labor, and it is from unwillingness or inability to wait six months or a year longer for a crop that our land has become so foul. Weeds carry off more than half our profits. He would not say that it would pay to kill weeds; he would not say that it would pay to farm at all; but unless we are to give up farming altogether, it will pay to kill weeds. He described his method of "fall fallowing," breaking up say a three year old clover sod in July, and afterward keeping down the weeds by the use of the cultivator; plowing the land again in October, and, if possible, again before winter sets in; sowing it to barley or spring wheat in the spring. The object of many farmers seems to be merely to check or retard the weeds for one crop. He wanted to get all the weed seeds in the land to germinate and then kill the young plants.

Capital might be employed to great advantage in under-draining. There are thousands of farms where under-draining, the destruction of weeds, and the consequent pulverization of the soil would double the crops and quadruple the profits.

On many farms money and labor might be employed to advantage in getting out stones and building fences. On many farms there is a good deal of the very best land that cannot be more than half plowed on account of the stones. Every stone removed "leaves a

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wheelbarrow full of manure behind it." But we are so busy in the ordinary plowing season that few farmers can stop to get out stones. On his own farm the stones are found principally on the knolls and on his "fall fallows;" he makes a special business of plowing round these knolls, and has two men follow the plow to get out the stones. He takes off the wheel and coulter and puts the plow in as deep as possible, turning the furrow down hill. With the aid of a crowbar, the team can turn out a great many of the stones which have been plowed over for forty years, and which will continue to be plowed over for forty years to come unless we make a special business of getting them out.

When a farmer has under-drained his land, killed the weeds, and removed the stones and got them into fences, he is prepared to turn his attention to the higher branches of farming. The common error is to adopt some higher branch of farming before the land is ready for it. To buy a lot of short-horns and turn them into a wet pasture of coarse grass, rushes and weeds, is as unwise as it is to sow choice white wheat on a soil too wet and poor to raise a crop of Mediterranean. He would as soon think of recommending a young man to study conic sections before he had learned the multiplication table, as to recommend a young farmer to keep improved stock before he had commenced to improve his land. On such pastures as we often see, common cattle would do better, or rather suffer less, than the short horns.

The advantages of the short-horns lie in two facts: 1st. They have little offal, and the food they consume is converted into valuable meat. 2d. All animals require a certain amount of food to sustain the vital functions, and all the growth or milk is derived from the food consumed over and above this amount. He gave some figures showing the advantage of having a cow that would consume a large amount of food. The stomach of a short-horn is no larger than that of a common cow. How, then, are we to get her to eat more food? Simply by providing food of higher quality; food that contains more nutriment in proportion to its bulk; and it is for this reason that improved land is needed for improved stock. Land that is under-drained, well and deeply cultivated, and made thoroughly clean before seeding down, will produce far richer grass than in its natural state, and if properly manured the grass will be richer still. He had no doubt that a ton of such hay is worth more to feed out than two tons of ordinary hay; but of course it must be fed to stock that require concentrated food, and are able to digest and assimilate much

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more nutriment than their stomachs will hold of common hay. This is precisely what our short-horns are able to do. They are capable of eating and digesting a greater amount of nutriment—though not a greater bulk—than common cattle of the same size and age. And this is why they are so valuable. It is because they are capable of eating such a large amount of food over and above that required to support the vital functions. John Johnston, this past summer, sold a two-year old grade short-horn heifer to the butcher for $116. She weighed 1,300 pounds, and he says "there is nothing like Durhams." And this is true for him and all like him. But it may not be true for all of us. His land is thoroughly drained, thoroughly cultivated, as clean as a garden, and very rich, and his grass and hay are entirely free from weeds, and of the best quality; and it is not surprising that this grade short-horn heifer gained more in two years than many animals do in four or five, and this with nothing but grass and hay, except for a few weeks to ripen her off. The fact is interesting, as showing not so much the rapidity of growth and early maturity of a grade short-horn, as the nutritious value of the grass and hay from clean, rich, thoroughly underdrained land. If a farmer cannot or will not clean, enrich and under-drain his land, it is folly to spend money in getting improved stock. But after he has got his land in good condition, it is the height of folly to keep common, unimproved stock. He is throwing away the best part of his reward. It is supposed that none but a wealthy man can keep improved stock; but this is a great mistake. It undoubtedly requires a large capital to be an extensive breeder of thorough-bred short-horns, and he (Mr. H.) would advise no ordinary farmer of moderate means to have anything to do with the business. But he should avail himself of the skill, capital and experience of the celebrated breeders of the past and the present. He can well afford to buy a thorough-bred bull to use with carefully selected common cows. Mr. Johnston's grade short-horn heifer was obtained in this way. It probably cost him two or three dollars more than if it had been got by one of those wretched mongrel creatures so common in nearly all parts of the State. And at two years old he sells her for $116. The butchers in his (Mr. H.'s) neighborhood buy a good many two-year old heifers and steers for thirty-five dollars to forty dollars. If the owners have made a profit of five dollars over and above the cost of rearing and feeding, he did not know how they figured. Assuming, however, that they make ten dollars profit; and assuming also that it costs half as much again to feed the grade short-horn, the account would stand thus: Cost of

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keeping a common heifer or steer two years, thirty dollars; sold for forty dollars; profit ten dollars. Cost of keeping a grade short-horn, forty-five dollars; sells for $116; profit seventy-one dollars, or more than seven times as much as the other!

As civilization increases, so increases the demand for animal food; and the production of choice meat, cheese and butter, is the most difficult, the highest and the most profitable branch of farming. All our efforts should be directed to this end; but we must commence at the beginning. If our land is wet and weedy, it is throwing money away to buy improved stock before we commence to drain and clean it; and this to-day is the weak spot in our agriculture.

Before concluding, it might be expected that he should say something in regard to the capital required for improved implements and machines, but it is scarcely necessary. On ordinary sized farms we cannot afford to get a steam plow or a steam threshing machine. It will be but a few years before we shall be able to hire both. If he was short of capital he would rather spend $100 in draining tiles than in buying a drill. A reaping and mowing machine we must all have. He would try hard to raise the few extra dollars it costs to buy a steel plow rather than an iron one. He would buy a good harrow if he could find it. He would have a work shop and a vise and an anvil, and a good set of tools, and he would keep them in good order and always in their proper places, *if he could!* And so of bolts and nuts and tools to make them. The little capital required for these things will pay 100 per cent a year. A farmer cannot invest ten dollars to better purpose than to buy a barrel of crude petroleum, to wash his wagons and implements and reaping and mowing machines with two or three times a year. It does not pay to give a man $1.50 a day to load manure with a dung-fork that has a tooth broken out from one side and another gone in the middle. A dull, rusty hoe, from the less quantity and poorer quality of the work done, will in one week cost more than a dozen new ones. A good grindstone, set true and run by horse-power, for grinding tools, hoes, spades and plow coulters, will pay for itself in a month. He made his men grind their hoes every morning, and take a file with them to the field to sharpen them again as they become dull. The economical Teutons think it very extravagant to grind away the hoes, but he could buy a dozen hoes for less than he had to pay one of them for a week's work. In fact, he found that tools and implements cost nothing in comparison to what he had to pay for labor. And he was sure we

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can invest capital to a good purpose in providing a sufficient number for all emergencies, and of the very best description.

There is another way in which capital can be used with great advantage, and that is in keeping good horses. He did not mean fast or fancy horses, but horses that are strong and healthy and capable of doing a good day's work, 275 or 300 days every year. A man and team cost about $600 a year, and it is certainly poor policy to buy an inefficient team because we can save $100 or $200 in the original purchase.

And we can use capital to good advantage in keeping over some old oats and old corn. These may be considered small matters, but the profit or loss of farming depends very much on our attention to or neglect of such apparent trifles.

Mr. Boardman of Ontario, would like to ask Mr. Harris if he thought a heavy crop of hay was worth more per ton than a light crop.

Mr. Harris thought that on dry, clean upland, the richer the soil the more nutritious was the grass, up to a certain point—say two to two and a half tons per acre. After we get up to three tons of hay per acre, the grass might not be as nutritious.

Mr. Curtis, of Saratoga, gave an interesting account of an English man in his neighborhood who had renovated a worn-out farm with great profit to himself, besides setting a good example to the neighborhood. He did this by draining and cleaning the land, and using the muck thrown out of the ditches on the swamp land. This swamp land since it was drained produced great crops of corn and grass. Two crops paid all the expense of draining, &c. The agriculture of his county was improving. The farmers were paying more attention to good stock. They had a Farmers' Club, which was doing a good work. The Fairs were well attended and much grade stock was disposed of at good prices.

Solon Robinson made some remarks, quite foreign, for the most part, to the subject under discussion, decrying the present system of State and local agricultural shows, and referring to the benefits of market fairs.

Mr. Faxton, of Oneida, did not agree with an incidental remark of Mr. R., that this fair was in some respects a failure. He had attended many of our fairs, and had never seen a better one. In regard to the subject under discussion, he would remark that under draining will

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pay better than any other improvement. Manure, too, is very important. In old times he had seen hundreds of loads of manure drawn out in the winter on to the ice on the Mohawk river, so that when the ice melted it might be carried off. That day has passed. We now need manure, although even yet many farmers do not pay sufficient attention to the matter. Some years ago he drained a field of eight acres with *brush* drains. It cost him $4 an acre, besides cutting and putting in the brush. It afterward produced splendid crops of oats and grass. In draining this field he found a spring in the center that was worth more to him than any ten acres on the farm. He thought that even at the present time there was more land on the Mohawk flats that was unproductive than there was that was productive. It needs draining.

n answer to a question, Mr. F. said he would use manure as soon as it dropped from the animal.

Some one objected to the question as being out of order. when Mr. F. replied that "if manure was not the farmer's capital he did not know what was."

Mr. Boardman, of Ontario, had drained twelve acres of land, which previously, except on the knolls, would not produce wheat. Put in the ditches two and one-half to three feet deep and thirty-six feet apart, costing in all about thirty dollars per acre. Plowed it deep and got out the stones by putting two men to follow the plow with crowbars. The field this year produced forty bushels of Diehl wheat per acre. He intended sowing it to wheat again this fall, but having read what Mr. Harris said in regard to "fall fallowing" for barley he had resolved to try it on this field.

D. W. Seeley, of Albany, gave an account of his manner of restoring a ten acre piece of land that had been used as a brick yard. He drained it at a cost of $100 per acre. He put on large quantities of manure, ashes, &c.; plowed it in the fall, so that the frost could pulverize the soil; sowed corn for fodder. It was nine feet high. Next year he sowed two acres with Canada Club spring wheat; had 100 bushels from two acres. Then seeded it down with six quarts timothy seed and *one bushel* of clover seed per acre. (This statement was received with general laughter.) He had a great crop of grass. He thought the investment a profitable one. Draining, clover and plaster are what are needed to bring up land.

Mr. Hawley, of Onondaga, said he had two and a half acres of land that formerly did not produce anything. He drained it and then sowed it to oats, seeding down with half a bushel of clover seed and

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a peck of timothy seed per acre. Had a splendid crop of grass. It was very thick at the bottom, but did not rot; stood up well. Is now (September 17th) cutting the second crop. Thought the grass richer and better for such thick seeding. It does not contain so much woody fibre.

Mr. Bronson, of Ontario, a well known sheep breeder and an experienced farmer, said such thick seeding would not answer on soils of only moderate fertility. Farmers should use more capital and cultivate the land more thoroughly. In the best town in Ontario county (one of the best counties in the State), three-fourths of the land is not half cultivated. All agree that it will pay to use more capital. If we used double the labor it would double our crops. Better invest our money in improving the farm than in bonds and mortgages. We must destroy the weeds and make more and better manure. We can invest capital to good advantage in improving our farm buildings, and in arranging them so as to do the feeding, &c., with less labor. Another way in which we can invest capital to advantage is in improving our stock. Nineteen-twentieths of even our best farmers have poor stock, and the more intelligent of them freely admit that it would pay them well to improve it. Agreed with Mr. Harris in regard to high feeding. Good feed and good treatment will afford more profit from ten cows than can be obtained from twenty-five kept as too many keep them.

Mr. Stoddard, of Broome, said the subject under discussion was one of great importance. It is generally admitted that we could use more capital to advantage in improving our land and our stock. We seem to know better than we practice, but we are slowly improving. Does not know of any tile draining being done in his town or in adjoining towns. Two years ago he tremblingly commenced to ditch, at thirty cents per rod, two feet deep. Drained two acres, at a cost of about eighteen dollars. The land previously was worth nothing. After draining he planted it to corn. It was a tremendous crop; was absolutely astonished at the result. He thought the improvement worth $150, or even $300; was going to drain more. Did not own the land where the outlet was, but had induced his neighbor to let him cut a ditch through his land in order to secure an outlet.

Mr. Boughton, of Saratoga, spoke of the importance of improving stock. And after this the discussion degenerated into a talk about hen manure, and whether it should or should not be mixed with ashes.

Mr. Hawley once mixed some ashes, hen manure and water

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together, and the ammonia escaped so rapidly as almost to drive him out of the barn.

Solon Robinson called attention to the fact that nothing was so good to deodorize all kinds of manure as dry earth. One gallon of earth a day would make the night-soil in a privy as pleasant to handle as the mixture of ashes and hen dung.

Mr. Dakin, of Schuyler county, used hen manure, ashes and plaster with good result on his corn, applied when the corn was growing. When used *in* the hill it sometimes injured the roots. Thought strawy manure should be piled till decomposed, and then applied on the surface

The chairman, Mr. Angel, of Livingston, closed the debate with a few appropriate remarks.

THURSDAY EVENING.

LEAKS IN DAIRY FARMING.

The discussion on Thursday evening was on "Leaks in Dairy Farming, and How to Stop them."

Hon. Harris Lewis, of Herkimer, opened the discussion in a very practical and sensible way. He remarked that, as a general rule, it is not the large leaks that ruin the farmer, but the small ones. The large ones are easily discovered and stopped, while the small ones are suffered to run on.

The first leak he would allude to, was the *manner of driving the cows to and from the pasture.* Many dairymen suffer the cows to be driven by dogs, and not unfrequently through a close and muddy bar-way, where permanent injury to the cows was often caused by their crowding and hooking each other. Boys are sometimes allowed to drive them with stones and sticks, often scaring them into a run. He would prefer a well-trained shepherd dog to any boy he ever saw. Carelessness in driving cows caused a leak of from ten to fifteen per cent.

2. *Time and Manner of Milking.*—Here is a big leak. No rough man, who storms or yells at the cow, should be allowed in the yard. The cows should be milked by the clock. Each man should have his own cows, and always milk No. 1 first, No. 2 next, and so on. It will not do to milk Polly first and Sally last in the morning, and Sally first and Polly last at night. Milk quickly and gently, without any noise or excitement. The cows will give more milk and more readily.

3. *Care in Feeding.*—It is important not only to provide good and

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sufficient food, but it must be fed regularly. If the food is delayed, the cows become impatient, and fret like a hungry child.

4. *Kind of Stock.*—A great leak is caused by keeping poor cows. Every year dairymen have to milk cows that do not pay for their keep. Has had cows in his herd that made 700 pounds of cheese in a season, while others in the same herd gave not more than 200 pounds. We should select our herd with great care, and then endeavor to improve it. We must raise our own dairy cows. The native cows are best to start with, if selected for their milking qualities. Then get a good thorough-bred bull of the breed we desire, and be sure that he comes of a good milking family of the breed. We should raise ten per cent every year. That is, in a dairy of fifty cows, we should every year raise five heifer calves, and when they come in, turn off five of the oldest or poorest cows. His own choice of breed is decidedly the Durham, unless the pastures are poor, in which case he should prefer the Ayrshire. The Durham is good for beef, and if a cow fails to be a good milker, she can be sold to the butcher at a good price. Two years ago there were 1,500 cows sold in the fall at an average of thirteen dollars, which cost seventy dollars each the previous spring. The cheese from such cows cost thirty-five cents per pound, while it was sold for fourteen cents. This is a big leak.

6. *Letting Hay get Over-ripe.*—This is a great leak. He would cut the grass when the first timothy blossoms appear, and so with clover. If you do not commence as early as this, the last cut hay will be over-ripe. Feed the early cut hay to the cows as soon as they come in. It is better than grain.

7. *Kind of Grass.*—Farmers are as wedded to timothy and clover as Ephraim was to his idols. They kill the native grasses by plowing the land, and then insist on making timothy and clover grow where the soil is not adapted for them. This is a leak equal to feeding a hog with a hole in the pig trough.

8. *Drainage* is destined to work a greater revolution in our grass land than all other things combined. The loss sustained from want of drainage constitutes one of our worst leaks.

9. *Poor Help to make Butter and Cheese.*—Better abandon the business if we cannot do the work ourselves or get good help. There is a great deal of butter made that is worthless except for grease. A few cents more a pound would pay for the best help and the best dairy utensils.

10. *Allowing manure to waste* is a great leak. He would always apply manure on the surface. As a dairyman, he would rather have

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one load of manure applied on the surface than ten loads plowed under. Would draw out the manure fresh, and apply it at all seasons when most convenient, on the meadows and pastures. Had not a foot of land on his farm that manure did not agree with. It is all moonshine to fork over manure and rot it. It leaks away. He spreads his manure on the surface, and goes over it with a brush harrow.

11. *Poor Implements* are a great leak. He would always get the best that were to be had.

There are a great many other leaks. We are all acquainted with them, and often promise ourselves that we will stop them. He would leave the subject to the meeting.

Mr. Curtis of Saratoga.—One of the most important implements on the dairy farm was the curry-comb. Most farmers leave the animals to do their own scratching. It is as important to curry as it is to feed. The cows like it. They get impatient for their turn. Knew a farmer who had a quarrel with his hired man because he would not curry the cows. It is a great mistake not to provide abundance of green food for extra feeding in summer. The cow is a machine for converting food into milk, and the more she will eat the better. It is a great folly to give abundance of food when it happens to be plenty, and to starve the animals when the food is scarce. Comfortable quarters, shelter and a good yard save half the food. He believed Mr. Lewis claimed that it saved *three-quarters* of the food. He did not agree with Mr. Lewis in regard to Durhams being the best breed. True, they are better for feed. But we want milk. A Durham cow will eat herself up twice a year before she is ready to turn off at the end of the year. He prefers the Ayrshire.

Mr. Lewis said he was at one time of the same opinion. The first thorough-bred bull he used was an Ayrshire. It make a splendid cross for rough pastures. But they are too energetic for a good cow. A cow is a machine for turning grass into milk, and he did not care how much she ate.

L. F. Allen, of Erie, said he was not a dairyman, but he had always taken a deep interest in the subject. He did not think we should cut grass as early as recommended by Mr. Lewis. Let it get ripe and then cut up and steam the hay. It saved *one-third* the food. This has been demonstrated. The usual objection made to it is the labor. But it will pay. Giving green food in the yard was one of the greatest improvements in dairying. By cooking dry hay we converted it into green food. Even mouldy hay was eaten with a relish

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after being cooked. The deleterious matter seems to be carried off by the steam. It is undoubtedly true that the more a cow eats the better. When cows come in to feed from the pasture, in an hour after they will eat again if green food is provided for them. We do not usually feed enough. This is the great leakage. We must have more system on the farm. Need laborers with less prejudice and more intelligence. In regard to what had been said about the Durhams, he would remark that Durhams gave good milk or poor milk, just as they have been *educated.* One hundred and fifty years ago the Durhams were considered the best milkers. But about eighty years ago some gentlemen in England began to improve the breed, and bred out the milking qualities from a portion of the stock. Others were good milkers. The same has been the case with Devons.

Solon Robinson.—Nothing has been said about water, which is as important as food.

L. F. Allen.—In winter it would pay to give warm water. It has to be raised to the temperature of the body, and the heat required for this purpose is derived from the food. Water should always be pure; abortion may be caused by dirty water. It was of great importance to have water in a pasture, so that the cows could drink whenever they wished. When watered only once or twice a day, they sometimes will not drink at the time, and at the next opportunity drink too much.

Mr. Hawley, of Onondaga, had a limestone farm. He spouted all his buildings and built large cisterns, and got all the soft water his cows wanted. His butter keeps as well as the best made in Chenango county. Farmers in this State sustained a loss of $2,000,000 a year from making poor butter. A butter maker must be neat, clean and *prompt.* Did not think it would pay to cut and steam hay for a small stock; might be profitable on a large scale. Better cut the hay early, and then it would not need steaming to make it palatable.

Mr. Bowen, of Orleans, asked if there was any cure for milk fever. Several gentlemen gave their views on this subject.

Mr. Harison, the Secretary of the Society, who was in the chair, in closing the discussion, said that it had been a very interesting one, and that he was glad it had partly been occupied with the question of the improvement of dairy stock. It was of less consequence what breed the dairy farmer resorted to for pure bred bulls for the purpose, than that he should begin the improvement; for if once begun it would be persevered in, and the question as to what particular cross was best suited to the district or to the special circumstances in each

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case would be solved by experiment, and one improvement would lead to another.

With regard to milk fever, he had, in common with many of the best breeders in this country, found great benefit in adopting the precaution recommended by the eminent English breeder of short horns, Mr. Edward Bowly, of Cirencester, which was to give the cow once a week, for three weeks before calving, a dose of one pound of Epsom salts, with the addition (which should be made to every purgative dose administered to cattle) of an aromatic, generally using a table-spoonful of ground ginger. In cases of milk fever, of which he had several severe ones in both winter and spring, but never a fatal one, the first object was to physic, and both purgative medicines and the enema syringe should be resorted to; the latter was particularly valuable. The constipation once overcome, he thought almost all cases would end in recovery, if the animals were well nursed and cared for. Another precaution against milk fever should always be observed, not to allow the cow to be chilled after calving, or to drink cold water. The chill should always be taken off the water.

Referring to the administering of spirits of turpentine, he said that turpentine was a very dangerous remedy, unless in the hands of a veterinary surgeon. Properly used, it was a very valuable medicine, but the farmer would find it safer to use it for other than medicinal purposes. The bloating referred to was a usual and not at all an alarming symptom in milk fever; it generally ceased as soon as the bowels were freely evacuated, and if it returned, the enema syringe should be again used. He closed by expressing the hope that the discussions at the winter meeting, next February, would be as well attended and as animated as the present one.

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DISCUSSIONS AT WINTER MEETING, 1870.

The Discussion Thursday Morning.

The meeting was called to order by ex-President Gould, who announced the detention of Mr. Willard by sickness, and made a few introductory remarks on bovine anatomy and the importance and difficulty of certain questions relating to dairy science. A cow has four stomachs, the first of which merely steams and cooks the food, the second forms it into pellets to be more thoroughly chewed and mingled with saliva, the third crushes and as it were cards it, pulverizing it finely, and the fourth only is really employed in true digestion, separating the nutritive and waste portions, and building up the beef. To get all the benefit of the food given, all the stomachs must work rightly together; if one is too small or inactive, everything goes wrong; and much more food is then required to lay on the same amount of flesh and fat. The trouble of ascertaining the relation of these stomachs to each other stands in the way of accurate knowledge of the cow's system, and renders this study peculiarly difficult. Many dairymen habitually violate natural laws, and such discussions as this ought to enlighten them. Some feed well during the milking season, but neglect their animals wretchedly at other times, so that when the milking season comes the cows have to draw on their own systems for it, which are impoverished and worn out. This leads directly to abortion and all sorts of evils. We *must* learn and obey the laws of nature if we would avoid certain disaster. Let each investigate one branch and learn it thoroughly, communicating the results to others.

Mr. Curtis, of Saratoga, had found it difficult for common farmers to come down to the minutiæ of experiments, ordinary work taking them off from close and accurate observations. He had observed failure of milk and growth among his own cows. Once a valuable Ayrshire (a great milker) appeared dumpish and had all the symptoms of "horn ail." He thought she had been drained too hard, and instead of doctoring for "horn ail," he gave her better feed and better care, to let her have an opportunity to gain strength, and was successful. Farmers drain and weaken their cows quite too much. They

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dry them off thin and weak in the fall, winter very carelessly on poor feed, and then milk hard again next summer wearing them out fast. This should be changed. Close, ill-ventilated, ill-littered stables, are another great mistake, and this brutality results in frequent abortions. Thus we stand in our own light, as well as torturing our poor animals. He himself adopted comfortable box-stalls. Greater variety of food should also be given. Has doubts about roots; the expense is so great and labor so high. But there are other things, and we can change the diet with meal, grain, &c. Cows should not be milked very closely up to calving time. Once milked his herd all through the winter, and up to the very day of calving, and found that they gave very little milk next season. He has now changed the whole programme, drying off about December 1, and finds it pays; no calves lost in spring. Then there is the satisfaction of having healthy, happy cattle, which is worth considering. We know well in this State how to use our milk; the question is how to get it.

Some discussion followed concerning the policy of growing root crops. Mr. Granger, of Saratoga, favored it; had raised 600 bushels per acre of Swedes, and thought we should follow the English example. Another member thought them too watery, and preferred grain. Mr. Winne, of Albany, had tried roots more or less for sheep ten or fifteen years, having seen a marked instance of their good effects in Canada, which he could never himself equal. He finds the worst difficulty in starting them to grow, especially if there is a dry season. The ground must be well manured and cultivated. Last year was dry and the roots only yielded half a crop, though the ground was in good condition. He feeds some roots every day; would not think of fattening sheep without them. They are a perfect remedy for the costive condition. A few roots are always beneficial, especially for breeding animals.

The chairman thought we were wandering from the milk question. Mr. ——— made some remarks on dairying which were wholly inaudible at a distance of twenty feet from the speaker. Another member thought roots suitable only for young cattle; the age makes a great difference, and old cattle need stronger food. Mr. Hawley, of Onondaga, had found two kinds of food (nitrogenous to support, and carbonaceous to heat) needed in winter. Turnips, mixed with carbonaceous food, are good for young or old; either alone will not force good or plentiful milk. Milch cows should be kept healthy and flourishing, but not in a higher condition. Give no grain in spring or summer, when grass is good, to a healthy animal, but do give it

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when grass fails. Cows should be dried off three or four months, or they will fail in milk and perhaps go farrow, as he has found by experience. As to keeping butter after it is made, care must be taken. Decomposition really begins at the moment of milking. Heat is the cause, and cold the remedy. Cool the milk as soon as drawn. Surround your can with a wet jacket of woolen material on its way to market or the factory. Milk should be poured all into one vessel and mixed up. He knew of butter sunk in a well twenty-five years, keeping perfectly good. He knows of a creamery with a large vat, surrounded by cold spring water and this preserves perfectly for any length of time the butter made during a season. Butter must be protected from the air as soon as it is made. Put over it a clean pure cloth, and an inch of nice salt, and then brine; put in a cool place, the jar of course perfectly sweet, and it will keep indefinitely if the butter was all right to begin with. Rancid butter, mind you, is putrified butter.

Gen. Patrick purchased a very fine cow (15-16ths or more Durham) in May, 1868; the best and richest milker in the vicinity. She would not come in season, and went farrow; she kept giving milk and you could not stop her, and this he thought the cause of her barrenness.

Mr. L. F. Allen thought dairymen neglected first principles. As soon as the cows are got, a good bull should be procured and kept secure. Many get a little runt of a bull, and turn him into the field, where he goes about teasing the cows, and making feverish and tainted milk. Bulls should be taken care of. Excessive use of bulls produces abortion, and generates diseases in bull, cow and calf. The fœtus becomes diseased and the cow throws it off. Soiling, he would add, is very desirable for dairy purposes. In Erie county, the quality of the cheese has much deteriorated since the establishment of cheese factories. Yet the factory system is a good one. He *never* lets a bull run, and believes in only a single service, or at the utmost two, and then shuts up the cow till heat subsides. Has no abortions.

Mr. Faile had had abortions, though the cows and bulls were kept up strictly according to Mr. Allen's rule. Mr. Allen suggested that artificial causes brought it about, and mentioned Mr. Prentice's case, where frequent abortions in a valuable herd were remedied by sending the cows up north to fresh pastures. The cause was a liberal top-dressing in the pastures of waste fur, which had decomposed and tainted the grass and hay.

Mr. Bouck, of Schoharie, said cutting hay early was of the utmost

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importance. An acquaintance of his brought two-year olds to look like three-year olds by early cutting. His father-in-law cut a fortnight earlier than his neighbors, with striking success. He has adopted the system, and his cows winter very much better.

Mr. Faile suggested the importance of comparative experiments with roots and other feed. Adjourned.

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THE GRASSES AND THEIR CULTURE.*

By Hon. John Stanton Gould.

A very brief glance at the vegetable kingdom will convince us of the vast importance of the grasses to the whole family of man; a more minute and careful survey of this great field of observation will make us wonder that the agricultural world has been content for so many generations to remain in so much ignorance of their nature and properties as we know they have always been.

We all, without exception, derive a great deal of pleasure from contemplating the beauty of the grass; "a thing of beauty," it "is a joy forever;" it exhilarates alike the prince and the peasant, the poet and the philosopher, the merchant and the mechanic, and cheers and gladdens all classes and conditions of men. Destroy the rich meadows and pastures of our farms, and how much of the pleasure as well as of the profit of a farmers life would be blasted. Remove the little green grass plat from the contracted yard of the citizen, and how much would the enjoyment of his domestic life be narrowed. When the prophet Isaiah would express the very extremity of desolation, he exclaimed: "The grass faileth; there is no green thing."

While the grasses are adapted to gratify the vision of all classes of mankind, their greatest charms are reserved for those who study them most lovingly and persistently, and observe with careful scrutiny all the minute details of their organization. These alone can appreciate the exquisite grace and harmony of their forms and motions, and the wonderful adaptation of their structure to the exigencies of their positions, and to the welfare of man. These alone can descry the marvelous uniformity of their plan, exhibited in the widest diversity of structure, which attests the touch of the divine finger in their organization, compelling them reverently to adopt the grateful exclamation of the psalmist: "Oh, Lord, how manifold are thy works; in *wisdom* hast thou made them all; the whole earth is *full* of thy riches."

The latest and most certain conclusions of science coincide with the Apostle's statement that "all flesh is grass;" they demonstrate most

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conclusively that in thus saying, he yields to no mere poetic fancy, but gives utterance to a sober and unvarnished fact. The elegant contour of the human form, the ear that drinks in the melody of song, the tongue that communicates the utterances of the soul, the sparkling eye, the ruby lip, and every portion of our material frame, owes its origin, either mediately or immediately, to the grasses of the field. It is their appointed function to gather and combine the scattered elements of inorganic matter in such proportions and in such forms as are best calculated to build up all the tissues which are essential for the manifestations of animal life. They extract saline ingredients from the rocks, hydrogen and oxygen from the rains and dews, carbon and nitrogen from the soil and the atmosphere, and mingling these together by a subtle and mysterious chemistry which man can never imitate, they lay these treasures at his feet in a form exactly fitted for his purposes. Very precious, therefore, is this promise of the Almighty, "I will send grass into thy field for thy cattle that thou mayest eat and be full."

WIDE DIFFUSION OF THE GRASSES.

While the grape, the fig, the orange, the bread-fruit tree, the vine, and most of the other productions of the vegetable kingdom are restricted to narrow belts of latitude, the grasses flourish in every region of the earth. They spring up spontaneously on the plain, on the mountain, and in the valleys by the water courses; they unfold their graceful panicles beneath the dull and leaden skies of the arctic region, they adorn the temperate zones with their refreshing verdure, while beneath the ardent skies of torrid climes their culms swell out into almost gigantic proportions, vieing in some of their varieties with the trees of more northern regions. Their leaves and culms furnish food for cattle, the seeds of inferior species furnish food for birds, while those of superior species furnish nutriment for man himself.

The importance of the grasses is shown in the relation which they bear numerically to the total vegetation of the earth. At least one-sixth of the plants that grow upon our planet belong to this family. Two hundred and thirty genera, embracing 3,000 distinct species of grass are known to botanists, and new genera and species are constantly revealed to us by the reports of travelers and the researches of domestic observers.

Two hundred and fifteen distinct species of grass are capable of being cultivated in Great Britain, and 133 species are proved to be indigenous in that island.

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Mr. Flint describes 125 varieties of grass as growing in the State of Massachusetts. Prof. Torrey, in the Natural History of New York, describes forty varieties of the genus Poa, twenty-seven of the genus Agrostis, and a total for the State of 125 varieties.

This wide diffusion of the grasses is due, in some degree, to the care which nature takes for their production and protection. The seeds of some varieties are provided with hooks by which they attach themselves to the hair and wool of grazing animals, and to the clothes of men, by which they are transported to regions widely remote from their origin. Their seeds, which form the favorite food of many birds, are retained in their stomachs and carried many hundreds of miles before they are voided; they then germinate under favorable circumstances, and thus the grasses of widely remote regions are interchanged. The seeds are very light and highly polished, which fits them for diffusion through wide areas by the combined agencies of the winds of winter and the frozen snows. Many of them are furnished with rhizomes or creeping roots, which send forth many shoots, and rapidly cover the ground where a single stem has once effected a lodgment. The annual decay of the stems affords a constant supply of food for the successive growths of the plant.

Nature has also provided for their protection after their first establishment in various ways. A large proportion of the species are perennials; they are uninjured by the cropping and the laceration of their herbage, which is soon replaced by the internal energies of the plant; on the contrary, this very laceration which would utterly destroy many families of plants, is really necessary for the most vigorous growth of many species of grass, and is essential to their continuance on the same area. The creeping roots, though bruised and torn by the heavy tread of cattle, are not injured by it, and the winter's cold and the summer's heat are alike unable to extinguish the principle of life within them.

Economical Importance of the Grasses.

We shall not greatly err if we assume that the present annual production of hay in the United States is 25,000,000 of tons, which, at ten dollars a ton, amounts to the enormous sum of $250,000,000. We have no means of ascertaining with precision what are the proportional areas of the pastures and meadows of the United States. We know that in the State of New York the proportion is as 1.35 acres of pasture to one acre of meadow; and the total area of improved land is to the total area of grass land as 1.46 to

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one. This proportion of pasture to meadow will hold good for the eastern and middle States; but in the western and southern States the proportion would be at least six acres of pasture to one of meadow. We shall, therefore, not be liable to overrate the area of pasture in the United States, if we assume that there are two acres of pasture to one of meadow, and the value of their annual production as at least equal to that of the meadows.

The annual value of the grass crop is therefore $500,000,000 in the United States. The annual value of the grass crop of the State of New York is $80,000,000, and in New England it is $70,000,000.

The remark has so often been made that "he who makes two blades of grass grow where only one grew before, is a great public benefactor," that the phrase has become proverbial. In view of the facts just stated, we shall be able to form a more definite estimate of its significance. We shall perceive that the making of two blades of grass to grow where but one grew before, is equivalent to increasing the annual income of New York by the sum of $80,000,000, the annual income of New England by $70,000,000, and the annual income of the United States by $500,000,000.

It is almost impossible for the mind to grasp so sudden and so splendid augmentation of our material prosperity, or the vast acceleration of human progress and human happiness that would be sure to follow in its train. We are groaning daily over the vast debt which has been left to us as the heritage of our last war for freedom and equality. Our legislators are prolific in schemes for its liquidation, and for relief from the presence of the taxation which it entails. Two thousand millions of dollars is the measure of that indebtedness, but if our farmers would resolutely impose upon themselves the task of making two blades of grass grow where only one grew before, the whole of this debt, stupendous and overwhelming as it is, would be paid by only four years of this increased income, without touching upon a single dollar of the revenue that they now enjoy.

The total amount of the debt now owing by the State of New York, and by all the counties, cities and towns included in it, including the bonds of towns and counties for the construction of railroads, is in round numbers, $137,000,000; two years of the increased income of New York, arising from the doubling of its grass crop, would pay the whole of this indebtedness, and leave a suplus of $23,000,000 in the treasury. The average amount of State tax levied upon the people of the State of New York, during the last twenty years, is $2,287,000,

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the interest on the increased income, reckoned at only three per cent, would more than pay these taxes.

What we have already said, refers only to the *direct* revenues derivable from the increase in our grass crops, we must now consider its *indirect* advantages. The vast increase of manure which will result from the consumption of this augmentation of the herbage grasses must wonderfully increase the production of the cereals millions of dollars will be thus added to our income.

The influence of grass culture on the growth of the cereals is very strikingly exemplified by a comparison of the agricultural statistics of France and England. France has fifty-three per cent of its cultivated area under cereal cultivation, while England has but twenty-five per cent. Those who hear the statement made for the first time will be surprised to learn that, notwithstanding this disparity between the areas of the grain lands in the two countries, England produces five and one-ninth bushels of grain for every individual of her population, while France only produces five and a half bushels for every individual of hers. Thus with less than half of the proportional area under cultivation, England produces within seven-eighteenths of a bushel per head of what France does.

She is enabled to accomplish this result solely in consequence of the manure furnished by her grass lands. Every acre of English grain land receives the manure from three acres of grass land, while in France, the manure from each acre of grass land is spread over two and a half acres of grain land, in other words, one acre of grain land in England gets fifteen times more manure than an acre of grain land in France. This statement tells the whole story, and assures us that a like increase of manure would produce a like increase of crops with us. There are many other incidental profits which will arise from the increase of our crops, but this article would swell into unreasonable proportions if we paused to enumerate them all, we will therefore leave our readers to think them out for themselves at their leisure.

The Doubling of our Crops of Grass is Possible.

It may be said, and it doubtless will be said, by very many farmers, that to talk of this doubling of our grass crops may be very well to point a moral or adorn a tale, but that it is quite impossible to accomplish it practically. They will assert that the idea is a "castle in Spain," a product of Utopia, an *ignis fatuus* which will only "lead to bewilder and dazzle to blind."

We believe, on the contrary, that it is perfectly practicable, not

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only to double but to treble and even quadruple our present production of grass, and we hope to bring all our readers to the same conclusion if they will have the patience to consider what we have to say in support of our opinion in this and the following pages.

Every live American will admit that what has been done once can be done again when the circumstances under which it is done are similar; they believe that like causes produce like effects, and that what one man has accomplished another man can also accomplish, if he brings to the task the same tact and energy and skill; but we know that many farmers cut two and three tons of hay from each acre of their meadows, other farmers have cut six or seven tons from an acre. From the irrigated meadows, near Edinburgh, twenty tons have been taken per acre in six several cuttings, in the same season. If other men bring the same set of causes into operation, why should they not obtain the same results? That the enormous disparity existing between the grass crops raised by different farmers in the same county, and in different counties in the same State, is not wholly due to irremediable differences of soil and climate, but to the skill or want of skill brought to bear upon the management of the grass lands, is made very clear by an examination of the facts as they exist.

We draw our proofs mainly from the State of New York because we are much more familiar with the meadows of that State than with those of the other States, but we know quite enough of these latter grass lands to be assured that the experience derived from them will fully bear out and confirm the conclusions derived from the meadows and pastures of New York.

We know from official data that the average production of the meadows of the State of New York is ninety-six tons of hay from each hundred acres of meadow land, and that the average production of hay in the county of Kings (in which the city of Brooklyn is situated) is 160 tons for each hundred acres of meadow, and that this county gives a greater average production of hay than any other county in the State. This amount, however, is very much less than is produced by very many of the individual farmers in the county, not a few of these raise three tons to the acre, and some of them get five tons of hay from two cuttings in the same season, and are thus in advance of the average production, from one hundred and forty to two hundred tons to the hundred acres. There can surely be no good reason, except ignorance and carelessness, why the average production of the county should not equal that of the best farmers in it.

The county of Queens lies contiguous to the county of Kings, and

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there is no appreciable difference between the soils or climates of the two counties, yet the average production of hay is forty-four tons less to the hundred acres of meadow than in the county of Kings.

The soil of Kings county is naturally very inferior to the soil of Onondaga county, as is shown by a comparison of the weeds and grasses growing spontaneously in the woods and uncultivated places in those counties; yet it nevertheless yields sixty tons of hay to the hundred acres more than Onondaga county does.

We have sought with great care to find in the geological and meteorological reports of the State, any *natural* cause for this superiority of Kings county in the production of grass, but have been utterly unable to find any. There is scarcely a county in the State, except Essex, where the natural grasses growing in secluded and uncultivated spots are feebler and more sparse than they are in it; it is only in the cultivated meadows where the superiority is manifested, and it is to skill and industry that it owes its existence.

On examining the reports on premium crops in the transactions of the New York State Agricultural Society, and in the transactions of other State societies, we find that active and energetic farmers are not satisfied with less than two or three tons of hay on an acre, on any soil, in any climate, or in any county of the State. Whenever a farmer really resolves that he will bring his meadows up to the standard, he always does so, if his acts correspond with his resolutions. Thus while the average hay crop of St. Lawrence county is only eighty-five tons to the hundred acres, there are many farmers who cut regularly from two to three tons to the acre, and we have been assured by a farmer of the contiguous county of Lewis, in which the average crop is 101 tons to the hundred acres, that he had a meadow that for several years had averaged five tons of hay to the acre.

Since then there is nothing in the county of Kings nor in its surroundings or accessories more propitious to the growth of grass than there is in any other county, but, on the contrary, its soil is less fertile naturally, and its climate less genial than many others; and since we find, even in that county, contiguous farms, separated only by a fence from each other, where one produces grass abundantly, while the grass on the other is so poor that it hardly pays for cutting, we cannot escape from the conclusion that the marked differences observable in the productions of our meadows do not arise wholly from differences of soil or climate or aspect or luck, but from the differences in the skill and industry which have been applied to their improvement. Surely the farmers of Onondaga county can produce

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as much grass on their superior soil as those of Kings can produce on an inferior one, if they only set themselves earnestly to the work of accomplishing it.

CAUSES OF THE INFERIORITY OF OUR MEADOWS.

We can see, from what has been said, that nature offers the most magnificent premiums for efforts to improve the production of our grasses, it is therefore clearly our interest to search for the causes of our admitted deficiencies, and to learn the conditions which she imposes upon the winners of her munificent prizes.

The main reason of the inferior condition of our meadows is that very few farmers ever *try* to improve them. It will not be denied that farmers, in general, bestow much less care, or thought, or science, or study, or labor upon their meadows than they do upon their grain lands.

Not one farmer in a thousand knows the names of the grasses growing on his farm, or can discriminate between them. Grass is grass, and that is all they trouble themselves to know. Like Wordsworth's Peter Bell,

> "A primrose by the river's brim,
> A yellow primrose is to him,
> And nothing more."

Very many farmers are not aware that they have any other varieties than timothy, clover (which is not a grass) and red top growing on their farms, although they may have a dozen or twenty other species; much less do they understand the peculiar properties and the relative values of the different species. The farmer goes on to his meadow when the proper season comes, and cuts his grass and converts it into hay; this being accomplished, he thinks no more about it until the corresponding season of the ensuing year, when he goes through the same process again. In consequence of this apathetic spirit, he gives himself no trouble to reseed his meadow or to manure it, or to irrigate it, or to drain it or to protect it from being poached by cattle in autumn or in winter. Even when they are first forming their meadows after tillage, there are thousands of farmers who never sow any seed upon their lands at all, leaving it wholly to the birds and the winds and the waters to supply the necessary seed; indeed, in the western States this plan is the rule and not the exception. Among those who really sow grass seeds on the lands intended for meadows, very few sow any other seeds than timothy and clover. In New England it is very common to sow red top (*Agrostis vulga-*

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ris); in Pennsylvania, blue grass (*Poa pratensis*) is sometimes sown; but those who have taken this trouble, congratulate themselves on having done a very virtuous thing, and seem to think, when they have committed these few seeds to the bosom of the earth, they have done all that man *can* do, forgetting that in the fine old meadows of England, which are the envy of farmers, and the admiration of the world, not less than thirty different species are found growing in a single sod.

There is another cause for the inferiority of our meadows which, though often overlooked, is of great importance, and this is the number of useless or noxious weeds that find place among them. We fear that if the meadows of the eastern and middle States were carefully examined it would be found that at least one-third of the plants growing in them were weeds of no intrinsic value, which are innutritious and unpalatable to the stock, and injurious to the flavor of the beef and butter. These foreign intruders injure the useful plants by their shade, and rob their roots of the nutriment existing in the soil. If the farmers of this State would rid themselves of this nuisance, it would add from ten to fifteen millions to their aggregate incomes.

We have stated that there are 6,000 separate species of grass, and we know from the analogies of nature as well as from revelation, that God made nothing in vain. Each species has some special niche to fill, some separate part to play in the grand harmony of nature, each was designed to occupy a position of utility, each one is better adapted for some purpose, or for some soil or climate or locality than any other; and yet with the exception of some thirty varieties, we are quite unacquainted with their special uses and adaptations. The worst of all is, that we are contented with this ignorance, we make no efforts to dispel it; the race has lived face to face with the gramineæ for 6,000 years and the solution of this great problem has never suggested itself to them as something which would greatly advance their interests. Not long ago we noticed a large tract of Lyme grass (*Elymus villosus*) growing on the banks of a rivulet. We asked the owner of the land who had lived on it over thirty years, whether his cattle relished it? He told us that he did not know; he had never noticed it, and could not tell whether the cattle would eat it or not. He had seen it growing there all the time in great abundance, but never knew its name, never inquired what it was, nor what it was good for. He had never even thought whether it had a name or a use. Meadow fescue (*Festuca pratensis*) is a very common grass in

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the counties bordering on the Hudson river, constituting about one fifteenth of the crop on the meadows. When it first came into flower this year we asked the first six farmers that we met with what they called it. Not one of them could name it; they were not quite sure that they had it on their farms; they had something that looked like it, but they were not sure that it was the same. Two of them thought that it was June grass (*Poa pratensis*). The difference between the two is so marked that an intelligent farmer should no more confound them than he should confound a horse with a cow.

It is well established, and farmers will readily acknowledge it, that among the few grasses that we know anything about, there is a very great difference in their nutritive value; this acknowledgment, however, is made in general terms, but when they are asked to specify the most nutritious kinds there will be as wide a difference of opinion as possible, no two will be found to agree in their specifications. Some will tell you that there is nothing like timothy (*phleum pratense*), others declare that orchard grass (*dactylis glomerata*) is the graziers sheet anchor, others cannot make sweet butter without red-top (*agrostis vulgaris.*) A Kentuckian will claim the supremacy for his favorite Blue-grass (*Poa pratensis*). Many New Englanders claim Fowl meadow (*Poa serotina*) as the king of grasses. While in Old England, the primacy is given without hesitation to Ray grass (*Lolium perrene.*) In some parts of Maine nothing is thought to approach Meadow fox-tail (*Alopecurus pratensis.*)

This Babel like confusion of opinions demonstrates clearly enough that we have no real knowledge on this all important subject, and that we rely only upon capricious guesses for the settlement of the problem. Chemistry it is true has offered its aid to us; analyses of some thirty species have been carefully made. No doubt these analyses are accurate and reliable; no doubt they tell us truly what alone they profess to tell, viz, the exact amount of nutritive matter in a given sample, but this unfortunately is not a reliable guide for the farmer in practical feeding. No matter how much nutritive matter there may be in the grass, if there are mechanical impediments, such as an abundance of stiff awns, to its reception into the stomach, or if the nutritive matters contained in it do not exist in such state as will permit their assimilation by the digestive organs, or if they are mingled with injurious or poisonous matters, they might as well not exist at all as they will make neither meat, nor milk, nor wool. There are other ambiguities in the results of chemical analysis as applied to grasses. The composition of timothy for example is different when grown on a

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sandy soil from what it is when grown upon a peaty soil, and this latter constitution varies again widely from what it is when grown upon a clay or a loam, so if it is grown in a very wet season it will be very different from a sample which has been grown in a dry season, a sample grown upon the sea coast will differ from one grown in the interior. The same plant if analysed when it is going into flower and when it is going out of flower, will be found to present as wide differences as though they were plants of different species. We must not be understood to undervalue the chemical analysis of the grasses, on the contrary, we place the highest value on them, and heartily wish that we had many more of them. In order to make them available for the purposes of the grazier something more is needed, and that is actual trial at the manger of equal weights of the grasses to be compared, and finding by accurate weighing which is capable of putting on the most meat. The scales and the price current will then settle the question of their comparative value conclusively. We sought for such experiments in all the libraries to which we could obtain access, but have sought in vain. If there is one single reliable experiment having for its object the determination of this vital question, it has escaped our vigilance.

We must fairly grapple with the undoubted fact that the science of grass culture is yet in the early dawn of its infancy. Until within a comparatively recent period (and such things are very common at the present day especially in the western and southern States), meadows and pastures were formed by the simple process of leaving the land after a cereal crop had been taken from it, for nature to take care of; such grasses as came by chance grew without the slightest intervention of man; if good grasses took possession of the ground it was well; if poorer varieties established themselves, there was no help for it; the farmer did not dream that he had any more choice or control in the matter than he had in the formation of the clouds or the direction of the wind.

When, therefore, we see that most of what are now considered our best meadows and pastures, are those that have been formed by nature without the aid of art, it is not unreasonable to suppose that when science and practical skill are systematically applied to their culture, we shall achieve better results than any that we have hitherto attained.

From what we have said above it will be inferred that we make no high pretensions to very extensive knowledge of this great subject. We *cannot* teach; for the knowledge we seek for is yet to be acquired,

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nature hitherto has not been faithfully interrogated. If we succeed in impressing our readers with an adequate sense of their own ignorance, and in pointing them to the path in which they must walk in order to obtain light and knowledge, our utmost hopes will have been fulfilled, and we shall flatter ourselves that we have rendered no mean service to the cause of agricultural science.

EARLY ATTEMPTS AT IMPROVING GRASS LANDS.

Down to a comparatively recent period no attempts were made in England for the improvement of grass lands; the only thing that the husbandman did for them was to let them severely alone. Mr. Sinclair tells us that "the first mention that is made of ray or rye grass in the early books of British husbandry, is in the 'Mystery of Husbandry discovered and laid open,' by J. Worlidge, A. D., 1681." In this work he speaks thus: "Ray grass" (*lolium perrene*) "by which they improve any cold, sour clay weeping lands which is unfit for sainfoin" (*hedysarum onobrychis*), "hath the precedence of all other grasses, these are, lucerne" (*medicago sativa*), "clover" (*trifolium pratense*), "tares" (*vichia sativa*), "spurrey" (*spergula arvensis*), and "trefoil" (*lotus corniculatus*), which includes all the forage plants that he enumerates. His account of the ray grass concludes as follows: "Four acres of this grass hath yielded twenty quarters of seed and fourteen loads of fodder, besides the spring and autumn feeding, whereon six or eight cattle usually grazed." At this time the only species of perennial grass ever sown artificially, was this ray grass, and its culture had then just commenced; from this beginning, ray grass gradually spread over the whole kingdom, and has ever since maintained its high reputation. It continued to be the sole grass sown until the close of the American revolution, when timothy seed was introduced by the returning soldiers from this country, A. D., 1776 to 1780. Orchard grass (*dactylis glomerata*) began to be introduced about the same time, since that period the number of varieties under cultivation has steadily increased. The publication of the Hortus Gramineus Woburnensis under the patronage of the Duke of Bedford, caused a great improvement in the management of grass lands, and shed a flood of valuable light upon the management of meadows and pastures in England, although its author proceeded upon erroneous principles in determining the relative nutritive values of the different species of grass.

The making of artificial meadows began to receive attention even from the first settlement of this country. In a work written by

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Jared Elliott, in 1749, and now in the library of Hon. Marshall P. Wilder, the cultivation of timothy and Fowl meadow (*Poa serotina*) is strongly recommended, the latter grass is especially lauded as in many respects better than any other. Timothy and red top were sown very extensively, and sea weed and fish were successfully used as manures. Although we were thus early in forming artificial meadows and pastures, our subsequent improvement has not kept pace with our early enterprise, and we are now far behind England and Scotland in this department of husbandry.

What is Requisite for the Improvement of our Grass Lands.

It will be admitted that a gigantic work is to be performed by the farmers of America, which requires for its accomplishment a large number of intelligent laborers and a long period of time. Let us try to acquire a clear understanding of these requisitions. They are:

1st. That the special use of each of the 6,000 species of grass should be accurately ascertained.

2d. That the absolute and comparative values of each species should be ascertained by chemical analyses, and by practical trials at the manger to be tested by the scales.

3d. That the adaptation of each species to different soils, climates and circumstances, should be tested by thorough and repeated trials.

4th. That the period of its growth when it contains the greatest amount of those properties on which its value chiefly depends, shall be thoroughly investigated until it is fully determined.

5th. We must learn the kind of culture, and the manures best adapted to stimulate its growth and to increase its valuable properties.

6th. We must determine the time of flowering of each species, and the period when its seeds are ripe.

7th. We want to know what kinds of insects prey upon each species, and the best method of preventing their ravages.

8th. The best and most economical means of curing and preserving them.

These problems are obviously difficult; their investigation involves some of the most subtle questions in vegetable physiology and physiological chemistry, and all of them require, for their successful solution, clear heads and willing hands in abundance. These clear heads and willing hands must receive no little preliminary training before they can enter intelligently and successfully upon this inviting field of labor. First of all, they must learn to distinguish the family of grasses from all the other families of the vegetable kingdom with

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absolute certainty, and then to distinguish each of the individuals of the family from the others, giving to each its own proper and peculiar name.

The gramineæ form an exceedingly natural family, and for this very reason it is difficult for a beginner to distinguish readily individual differences; hence it is necessary to study every part of the plant with great care and discrimination; and for the purpose of description, it is essential that every organ, and every peculiarity that is met with in it should receive a special name. In a word, to insure success in our undertaking, we must become familiar with the terminology of botany. We do not deny that many obstacles beset the threshold of this science. We can easily understand that when the beginner, with a grass in his hands, attempts to compare it with the description in his botanical manual, the strange, uncouth words made use of, and the curt and apparently inadequate descriptions will almost induce him to abandon his efforts in despair. But he must resist this temptation sturdily and perseveringly. Patience will assuredly enable him to overcome every obstacle; if he will let it have its perfect work, every hard thing will become easy, and every crooked thing will be made straight. The words which at first appear so crabbed and unmeaning, he will find to be the symbols of very precise and definite ideas. When the symbol becomes familiar to his mind, it loses the repulsiveness of its aspect, and, like the widow in the story of the Fakenham ghost,

> "He learns to love the sound
> That frightened him before."

He will find, too, on a closer examination, that there are not as many hard words to be mastered as he first supposed there were. The same word may be used a dozen times on the same page, and from want of familiarity with it, he thinks he is encountering a new word, but a little attention will satisfy him that he is quite mistaken in his estimate, and that when he has thoroughly mastered about 100 words, they will take him safely over all the shoals and quicksands with which his journey through the grass is beset.

How to Study the Grasses.

It is not our purpose in this work to attempt to teach the science of botany, or to enter into those minute details of structure which may be found in every treatise upon botany, but as all these treatises are singularly deficient in elementary information, and as the greatest

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difficulties encountered by the student arise from his ignorance of these details, we propose to give a plain exposition of these elementary descriptions and definitions which we hope will prove to be of material assistance to the beginner in the study of the grasses.

The first thing to be done is to learn what a grass really is; to separate this from every other family in the vegetable kingdom, with ease and certainty. There are many plants which do not belong to the family but yet closely resemble it, such as the sedges. There are others which do not resemble the family, but are yet in popular language called by its name, as clover, lucerne, &c. There are several true grasses which are not usually called so, such as Indian corn, wheat, &c. We must learn to avoid all mistakes about these matters, and we can avoid them if we will remember that every plant that has the following characters is a grass. It must have

1st. *A hollow stem.* Or if not hollow, it is filled with pith like Indian corn. There is one exception to this rule; a grass which grows on the sand beaches of New England, and known there as beach grass and mat grass (*Ammophila arundinacea*), has a solid stem. *Molina cerulea*, when grown in wet places, is also solid in the stem.

2d. *Its horizontal section must be circular.* In other words the joints of the stem are cylindrical; it can be rolled backward or forward between the fingers with facility. There are one or two exceptions to this also, the best known of which is called wire-grass, blue-grass, and green-grass, in different sections of the country. It receives its specific name (*poa compressa*) from the fact that the horizontal section of its stem is oval, or more properly lenticular; it appears like a cylinder that has been compressed in one of its diameters; it cannot be rolled between the fingers.

3d. Its stem or column must be separated into sections by solid, horizontal partitions, called *nodes*, the intervals between the nodes being called *joints*. This character has no exceptions that we know of. If the stem of any grass is cut longitudinally through the middle, the nodes will be seen separating the tube into distinct compartments. One of the nodes is seen at Fig. 3, where it is erroneously marked "joint." It must be remembered that the joint is the space between the nodes.

4th. *The leaves must be alternate;* that is, given off on opposite sides of the culm, but not opposite to each other. This character is without a single exception, and we must try to make it perfectly clear to our readers. Examine Fig. 1, which we copy from Doctor Gray's "Structural and Systematic Botany." The several parts, *a*

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b c, etc., are called Phytons (from the Greek Φυτόι, plant), or plant elements. Observe that the leaf *a* emerges from the left hand of the stem, and the leaf *b* on its right hand, but above *a*; when leaves grow in this way, they are called *alternate*. If the leaf *b* had been brought downward, so as to be on the same horizontal plane with it, the leaves would have been said to be *opposite*. We have said that the horizontal section of the stem of a grass was a circle. Like all circles it contains 360 degrees. The leaf *b* is therefore inserted at a point one-half the circumference of the stem, or 180 degrees from *a*; but above it, in like manner, the leaf *c* is above *b*, and 180 degrees from it, and in the same way *d* is above *c*, and 180 degrees from it, and so on to *g*. The leaves, therefore, are arranged spirally on the stem, and are all separated 180 degrees from each other. It follows from this that the third leaf will always be vertically over the first leaf. Thus *c* is the third leaf from *a*, and is vertically over it; *e* is the third leaf from *c*, and is vertically over it. A plumb line let fall from *e* would exactly coincide with *c* and *a*. Plants that are arranged in this way are said to be *two ranked*. This arrangement should be carefully borne in mind, as the phrase will be used hereafter.

5th. *The nerves of the leaf are parallel to each other*, not branched. This mark is common to all monocotyledons. Any one who will look on the *under* side of the leaf of a corn stalk or any grass will see more or less protuberant ribs running the entire length of the leaf. These ribs are called *nerves* when speaking of the grasses.

6th. The dilated petiole, or sheath, *surrounds the stem* from the node to the blade, and is furnished with a more or less manifest scarious appendage called a *ligule*. The *slit in the sheath* is a very important mark of distinction between the grasses and the sedges. We believe there is not a single sedge where the sheath can be separated from the culm without tearing. Some of these terms may require some farther explanation to make them intelligible to beginners. The *petiole* is the stalk upon which the leaf is supported, and which connects it with the branch. In most plants it is solid, but it is modified in the grasses, as may be seen in figure three. It is flattened, and surrounds the stem from the node to the ligule; but is slit down all the way, and cannot be opened without tearing it. When the petiole assumes this form it is called a *sheath*. *Scarious* means a thin, dry, membrane-like substance. The pith of a goose quill is scarious.

7th. *The flowers are generally perfect or monœcius.* They are *imbricated with two ranked glumes or bracts.* The outer pair

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(glumes, see figure 6), subtending a spikelet (figure 4) of one or several flowers; the inner pair (paleæ figure 5), inclosing each particular flower which is destitute of a proper perianth. Stamens vary from one to six. *There are usually three* (figure 7). The anthers are versatile and variously colored. The ovary is one celled and one ovuled, usually having two to three scales at the base. The styles are mostly two or three parted. The stigmas are plumose. The spikelets are either paniculate or spiked. Several words in this seventh characteristic of a grass must be explained. A *perfect flower* is one that has both stamens and pistils. *Monœcious*, when both the stamens and pistils are borne on the same plant. *Imbricated* is when one covering overlaps the other, as shingles on a roof, breaking joints. The perianth is the covering of the stamens and pistils. It sometimes consists of the calyx alone, and sometimes of the calyx and corolla. The anther is said to be *versatile* when it is attached to the filament at a point near its center, so that it can swing to and fro freely. Spikelets are said to be *paniculate* when they grow upon secondary branches. When the spikelets grow upon the main branches they are said to be racemed. Flowers are *spiked* when they grow directly from the rachis without branches. The other terms made use of will be readily understood by an examination of the figures referred to. These seven characteristics, taken together, constitute substantially the definition of the grass family, as given by Dr. Darlington, and we have met with none which we think more clear and accurate. Whenever we see a plant which presents this assemblage of characters, we shall know that it is a true grass. Whenever we fail to find this assemblage of characters, we may be sure that it is *not* a true grass.

The only families of plants that the beginner will be likely to confound with the grasses are the sedges and rushes. We will, therefore, point out a clear mode of distinguishing them from each other. We have seen that the sheath of the grass is split through its whole length and can be removed from the stem without tearing it, while the sheath of a sedge is *not* split and *connot* be removed from the stem without tearing. This gives us a very clear and intelligible means of distinguishing between them. We have already stated that the leaves of *all* the grasses are distichous or *two ranked*. We have now to state that *all* sedges are tristichous or *three ranked*. What this means we will now explain. On examining figure two it will be seen that the first leaf emerges at 1, the second at 2, and the third at 3, and the fourth at 4. There are, therefore, three leaves

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on the circle, each leaf being higher on the stem than its predecessor. There is, therefore, an interval of 120 degrees between the leaves, and the fourth leaf is vertically over the first. All the leaves of a sedge are spirally arranged around the stem with this constant interval between them. This is what is meant by a three ranked arrangement. Any one who will take the trouble to remember it can never mistake a sedge for a grass. Rushes, when their leaves resemble grass, as in the genus Luzula, have flowers composed of six parts or points, within which lie six stamens and a triangular ovary containing *three* seeds, while a grass has but *one* seed in the ovary. When, therefore, the plant has more than *one* seed in the ovary, you may be sure that it is *not* a grass.

We have said that the grasses form a very natural division of the vegetable kingdom; it is this fact which causes the difficulty of discriminating between the individual species. When we say that the grasses form a very *natural* division, it is equivalent to saying that they all have a great deal in common; it is therefore evident that those things which they *do not* have in common must be sought for with great care in order to identify the species.

Since one species of grass is distinguished from every other species, by certain peculiar properties, such as the number, situation, proportion, and color of the different parts of the structure, we must be well acquainted with these properties, and with the precise names of the several parts.

STRUCTURE OF THE GRASSES.

In the grasses, we meet with the following parts. Although they are tolerably constant in form in individual grasses of the same species, yet they vary so much in different genera, as to afford characters sufficiently distinctive for their separation. They are:

1. THE ROOT, or descending axis. This organ is modified, and named as follows:

(*a*). *Fibrous*, when the root is composed of a number of threads or fibres, as in *Poa annua*, or *Poa trivialis*. We give, in Fig. 8, the fibrous root of *Rottbolia filiformis* as an example of this form, but the student should not depend upon figures, but examine the roots themselves.

(*b*). *Creeping*, when the root runs horizontally in the earth and pushes up stems from the joints with which it is furnished, as in quack grass (*Triticum repens*), and in wire grass (*Poa compressa*), a very good illustration of this form is given in Fig. 9, which represents the root of the small water hair grass (*Catabrosa aquatica*).

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(*c*). *Bulbous*, when the root consists of a solid substance in a spherical form, as in *Hordeum pratense*, when it grows in barren grounds that are occasionally overflowed, and in *Phleum alpinum*. This form is illustrated in Fig. 10, which represents the root of *Phleum pratense* (variety *longiaristatum*), and Fig. 11, which is the root of *P. pratense* (var. *longiciliatum*), which shows a succession of bulbs. The roots of grasses are mostly of the kind known as "fibrous," indeed these are the only true roots, as these are the only organs that extract nourishment for the plant. The creeping part of the root, or *rhizome*, as it is called, is simply an underground branch, and not a proper root. All plants receive their food from fibrous roots alone, the rhizome and the bulb are organs added to the true root, and are not really essential parts of it. Bear it in mind that true roots never have any buds upon them; if, therefore, we meet with any underground growth that has buds on it, we may be sure that it is *not* a true root.

The root extends by successive elongations, being continued by protrusion outward, like the inner joint of a telescope from the outer. This form of development, which is called by botanists *Endorhizal*, (from two Greek words signifying "from within a sheath") may be well observed in the germination of the larger cereal grasses, such as wheat, barley, &c. Some of these extend to very great lengths in search of food and moisture, branching off into innumerable fibrils or rootlets, the ends of which, consisting of the newest cells or growths, form the *spongioles* or suckers, by which the nutriment is conveyed from the soil into the plant system. The fibrous roots of the grasses vary very much in their appearance; some are hairy, some are very much branched, some are very little branched, some are straight, and some are sinuous. The attentive observer will soon learn to recognize a species of grass from seeing the root nearly as well as he can from seeing the plant. Rhizomes will sometimes creep along under the ground for a very considerable distance. We have seen one of these from a stem of quack grass (*T. repens*), six feet in length. The function of the bulb in bulbous grasses seems to be to store up materials for the future growth of the plant. The differences among the roots of the different species frequently afford us distinctive characters when all other means fail. Thus the external appearance of the flower in *Poa pratensis* and in *P. annua* is exactly the same. We usually recognize the difference between them at a glance, because the latter is much shorter and yellower in color than the former; but in some situations *P. annua* grows much taller, and is of a darker green, so

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that we are in doubt as to whether we have a short *P. pratensis* or a tall *P. annua.* In this case the usual way is to pull one of the flowers carefully from the spikelet; if there is found something hanging from the base like a cobweb, we say that it is a *P. pratensis,* if there is no web at the base, we say that it is a *P. annua.* But in some rare instances we have seen a little web on the base of *P. annua,* and sometimes it is very difficult to find the web of *P. pratensis.* In order, now, to determine the matter we resort to the root; if it has a rhizome it is *certainly P. pratensis;* if it has a fibrous root it is surely *P. annua.*

2. THE CULM, STRAW OR STEM.—The ascending axis of a grass is called by these names indiscriminately. It will be remembered that this part is hollow, cylindrical, separated into long or short lengths by the intervention of nodes which are solid, and which tend much to strengthen its structure. It is evidently to accomplish this object that the nodes are placed near to each other at the lower part of the stems, where the strain is greatest in consequence of their swaying backward and forward in the wind, and more remote upward from which the newer and more delicate leaves are supsended. Culms afford several points of comparison and distinction between different species of grass. Some are quite smooth and glossy, others are deeply ribbed, others are armed through their entire length with hairs, or they may only be found on parts; which hairs may be long or short, bristly or downy, according as this kind of armature is coarse or harsh, or fine or soft. The nodes may be of a different color from the culm, or like it; may be armed with a similar variety of hairs, or may be perfectly smooth. The nodes in some species swell out beyond the circumference of the culm, or may be of less diameter than it, or just equal to it; in either of these cases they afford good grounds of comparison.

3. THE LEAVES consist of the following parts:

(*a*) The *sheath,* or modified petiole.

(*b*) *The Ligule* or tongue.

(*c*) *The Lamina.* The blade or flat part of the leaf; that which, in common speech, is called the leaf.

The sheath is not only the foot stalk of the leaf, but also performs the functions of the leaf itself. Like it, it is provided with a perspiratory apparatus, and like it, it stores up chlorophyl, starch and sugar; throughout its whole length it enwraps the culm, and may be easily disengaged from it without tearing; a circumstance which, as we have already said, serves to distinguish the grasses from the sedges,

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the sheath of the latter being a continuous tube in which the solid and often triangular culm is *inserted*, not folded.

The Ligule. At the point where the sheath ends and the lamina begins there is a thin and white semi-transparent membrane which is called the ligule. (See fig. 3.) As the botanical works which are most in use give very meagre descriptions of this organ, and as it is of the greatest use in diagnosis, it may be desirable to give here some of the terms employed by writers on the grasses to distinguish its various appearances. It is said to be *entire*, when it has no segments, or when there are no indentations in its exterior boundary line; *bifid*, when it is divided at the apex into two parts; *lacerated*, when it appears as if torn on the margin; *ciliated*, when the margin is set with short projecting hairs; *truncated*, when the upper part terminates in a transverse line; *acute*, when it has a short, sharp point; *acuminated*, when it has a long projecting point.

Its value as a distinctive character may be drawn from a comparative examination of *P. pratensis* and *P. trivialis*, which look exactly alike in their external aspect, but may be exactly distinguished by an examination of their ligules. They are truncated or obtuse in the former and long and pointed in the latter. The value of this organ in diagnosis arises from its remarkable constancy in the same species. Mr. Sinclair says: "I have raised a great many species of different grasses from seed, under different circumstances as to soil and situation, with a view to obtain varieties from them. I found many of the plants thus raised to vary from the parent in the number of the florets, in the presence or the want of hairs on the surface, and sometimes, though rarely in the awns; but in *no instance* did the form of the ligule vary. Being thus constant, it may be depended on." This statement corresponds with my own experience. Writers on the subject say that the use which this part of the leaf subserves is that of more securely fastening the upper part of the leaf to the culm, when the wind tends to tear the leaf downward; but those grasses that are unprovided with ligules are no more liable to this accident than those that have them, and they are, besides, too thin and delicate to add much to the strength of the attachment. We fear it will be the wisest course to acknowledge that we are wholly ignorant of its uses.

The Lamina, blade, or flat part of the leaf is the expanded portion. It is sometimes large and drooping, as in elymus and zizania; occasionally it is very minute, especially when compared with the sheath, as in *Avena pubescens* and *Festuca ovina*. In some species

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the blade is long and the sheath is short, as in *Festuca duriuscula*. The lamina is traversed by longitudinal parallel lines, which are known as the leaf veins, nervures, or simply nerves; these may be broad, narrow, rigid, soft, armed with rough hairs which sometimes point forward, sometimes backward; others have the hairs only on the back of the leaf; others only on the upper side; some have them only on the nerves, and some only on the edges, while some are covered with them everywhere. These differences are all very useful in marking the distinctions of species and in indicating their agricultural values, as, for instance, grasses in which the herbage is covered with long downy hairs, are mostly poor and innutritious in quality; on the other hand, those of a harsh and rigid structure, with serrated leaves, whose edges act as a saw, and whose flat blades perform the office of a file, even if they were nutritious, would, nevertheless, be rejected by cattle on account of their mechanical inconveniences.

4. THE FLOWER consists of:

(*a*) *Floral envelopes.*

(*b*) *Fertilizing organs.*

The floral envelopes are composed of the *Glumes* (see Figs. 4 and 6) or outer husks, which are the equivalents of the calyx in other flowers, and of the *Paleæ*, sometimes called glumule or inner husks (Fig. 5) which are equivalent to the corolla of other flowers.

Very many points of distinction are afforded by the floral envelopes. The glumes differ greatly in shape and in the presence or absence of longitudinal lines or ribs or nerves. They may be large enough to include or conceal the paleæ, or they may be very much smaller, so as to allow the latter to be seen towering above them. The inner and outer valve may differ in size or shape, as, for instance, in the Panicum family, where one of the valves is so small that it may be overlooked without close scrutiny; others, such as Paspalum, have but one valve. Some difficulty is experienced by beginners in distinguishing between the *inner* and *outer* glume; but a careful examination of the *lower part* of the glume will always make this matter quite clear. On examining any species of grass, or figure 6, it will be clearly seen that one of the valves overlaps the other, at least at the base, and this overlapping valve is always the outer. It will also be well to bear in mind that the outer is likewise called the *lower* glume, and that the *inner* is in like manner called the *upper*.

The paleæ are more constantly resorted to than perhaps any other part of the plant to determine distinctions in species. To examine them to the best advantage, we must be provided with spring forceps,

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and cambrick needles inserted in wooden handles, and a good pocket magnifying glass. They are subject to great differences in form and structure; some are covered with hairs, as Fig. 12, which is a magnified view of the paleæ of *bromus mollis*, and some have the hairs only on particular parts, as the edges, as is seen in Fig. 13, which is a magnified view of the paleæ of *bromus racemosus*, where the edges of the inner palea are ciliated. Some are awnless, others have straight awns, as in Figs. 12 and 13; some are bent, some are twisted, some are both bent and twisted, as in Fig. 14, which gives a magnified view of the paleæ of *trisetum pratense*. The place where the awns are inserted on the palea must also be noted; some are inserted at the bottom of the palea, others in the middle, others just below the top, others proceed from the very tip, and are, in fact, prolongations of the mid rib. In some the awns are longer than the palea, in others they are shorter, and in some they are of equal length. The nerves of the palea must also be noted; they vary in prominence and in number; in some there is only one nerve, in others three, and in others five. The paleæ differ in shape; some are round, others are keeled like a boat. Whoever will examine any member of the genus poa, will see at once what is meant by a keeled palea, and he will understand it still better if he will compare it with any of the fescues which have rounded paleæ. The most usual mode of discriminating between a fescue and a poa is to look and see whether the palea and glume are keeled, if they are so, it is said to be a poa; this test also decides between poas and glycerias. Some paleæ are grooved transversely, others longitudinally. Some have only a single palea, as in some species of agrostis. Their organs present so many and such definite marks, that the student will be well repaid for the most thorough and repeated study of all these peculiarities.

The FERTILIZING ORGANS consist of the *stamens* and *pistils*.

The stamens are constituted by the following parts:

The filament, which is a long flexuous hair-like body, seen in Fig. 7, springing from the base of the *ovarium*, springing upward and outward, then curving over about on a level with the top of the ovarium and inserted into the middle of the anther.

The anther is the box in which the pollen is secreted, and is deeply notched at both ends, as seen in Fig. 7. The line running through the middle is called the *connective;* there is a pollen cell upon each side of it; when the pollen is ripe the edges of the anthers burst open, and the pollen is scattered on the stigma of the pistil and thus fecundates the seed.

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The pollen is the fecundating dust of the seeds; among the grasses its color is, we believe, always yellow. In grasses the pollen grains are spherical. By watching the grasses as they come into flower, the whole process of *dehiscence*, as the opening of the anthers for the discharge of pollen is called, can be distinctly seen, and the pollen grains may be examined with a microscope. The anther is not much used in discriminating one species from another. The only thing to be observed is whether the filament and anther is longer or shorter than the flower. In the former case it is said to be *exserted;* in the latter, it is *inserted.* With a few exceptions the grasses of this country have three stamens; those, therefore, that have less than three are easily identified. *The pistil* is constructed with a *style* and a *stigma.* See Fig. 7. Our grasses have two styles each, having a feather like stigma. The pistils of our grasses resemble each other so closely that little use can be made of them in diagnosis.

5. *The seeds* or fruit vary very considerably in the different varieties, but these differences are very difficult to describe intelligibly, without specimens. Those who desire to study this part of the subject more fully, are referred to Mr. Sinclair's Hortus Gramineus Woburnensis, where they will find the seed of every species of grass accurately figured and described.

Having thus described the separate parts of a grass, we will now endeavor to explain the terms used to describe them in their aggregation. It is the more necessary for the reader to charge his memory with these details, as this part of the subject is much neglected by the authors of our elementary treatises on botany.

Herbage, denotes the leafy portion of the grass, and is that which chiefly concerns us in pasture. The quality of grass depends so much upon the quantity and physical character of the herbage, that for agricultural purposes, these should be studied with great care. If for hay, both bulk and quality are much influenced by luxuriant leafage, a character in which grasses will be found to differ in a remarkable degree; if, however, this be rough and unpalatable, that is, if it is the "sour grass" of the farmer, no matter how great is its quantity, its growth should be discouraged. Again, if it is to be depastured we must note such facts as its *longevity*, and the manner that it bears the constant mutilation arising from the bite and tread of cattle. *Duration* is also a very important element, as for permanent meadows and pastures, perennial grasses are indispensable; while for alternate husbandry, the annual or biennial varieties are best adapted, since the cultivated crop can be obtained much freer from foreign growth with

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the latter than with the former. *The culms* of grasses should be carefully considered with reference to their physical qualities; whether they are hard or wiry, soft or pliable, bitter or saccharine, scanty or abundant, should be ascertained, as the hay will be dependent on these circumstances with respect to quality and bulk.

Heads of flowers are aggregated from single spikelets or smaller bunches or bundles of flowers, which may vary in the following manner:

1. A single palea to each glume.
2. Two paleæ to a glume.
3. Three or more paleæ to a glume.

The use of the term spikelet is sometimes very puzzling to beginners, as it is not very carefully defined in our botanical books. It will help us to remember that in a great majority of cases it means all the florets subtended by a single glume; and that in a very few others, such as Elymus and its allies, it means the flowers collected within a single involucre. In this way all difficulty and confusion will be avoided.

Each spikelet is attached to the rachis or upper central stem.

(*a*) Directly to the stem itself, when it is said to be *sessile* or

(*b*) By a short upright footstalk, which is called a *pedicel;* in either case (*a* or *b*) the flowers are united into a compact cylindrical form called a *spike*, as in timothy (*Phleum pratense*), crab grass (*Setaria glauca*), or meadow foxtail (*Alopecurus pratensis*).

(*c*) They are on longer pedicels, forming an upright panicle as in *Aira flexuosa* or *Festuca pratensis.*

(*d*) On long and flexible pedicels forming a drooping panicle as in *Bromus secalinus.*

Distinctions of Quality in Grasses.

Grasses are not only distinguished from each other by differences in their external forms, but also by differences in their quality and the amount of nutriment that they afford. Mr. Sinclair, in view of his observations and experiments, is of the opinion that those grasses which are most closely allied to each other in their physical appearance are also most nearly related in the quantity and quality of the nutriment that they afford. Mr. Sinclair expresses his conclusions in the following words:

First. Grasses which have culms with swollen joints, leaves thick and succulent, and flowers with downy husks, contain a greater proportion af sugar and mucilage.

Second. When this structure is of a light glaucous color, the sugar

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is generally in excess. Prof. Gray's definition of *glaucous* is, "covered with a whitish bloom which rubs off, as the surface of a cabbage leaf, or a plum, or so whitened as to appear to have a bloom."

"*Third.* Grasses which have culms with small joints, flowers pointed, collected into a spike or spike-like panicle, leaves thin, flat, rough, and of a light green color, contain a greater proportion of extractive matter.

"*Fourth.* Grasses which have culms furnished with numerous joints, leaves smooth and succulent, flowers in a spike or close panicle, florets blunt and large, contain most gluten and mucilage.

"*Fifth.* When the structure is of a glaucous color and the florets wooly, sugar is in the next proportion to mucilage.

"*Sixth.* Grasses which have their flowers in a panicle, florets pointed or awned, joints of the culm smooth, sheaths of the leaves hairy, leaves smooth and succulent, contain most mucilage and extractive.

"*Seventh.* Grasses with flowers in a panicle, florets thinly scattered, pointed or furnished with long awns, culms lofty with few joints, leaves flat and rough, contain a greater proportion of saline matter and bitter extractive.

"*Eighth.* Grasses with strong creeping roots, culms few, leaves flat and roughish, and flowers in a spike, contain a greater proportion of bitter extract with mucilage."

This classification of the qualities of grasses with reference to their external forms, was published by Mr. Sinclair, in the year 1824, and so far as we know is the only attempt of the kind upon record. Its importance, if it is correct and reliable, cannot be over-estimated. But it is a matter of too much importance to be received upon the testimony of any one man, however eminent. It is a strong confirmation of the statements that we have previously made in these pages of the apathy of farmers and grass culturists in the management of their business, that in the forty-five years which have elapsed since their publication no one has ever attempted to verify these propositions. We have several times attempted the work but have been deterred from completing it, from the want of reliable chemical analyses in a form adapted for comparison, and especially from the absolute want of those practical trials of the comparative nutritive values of the grasses at the manger, and with the scales of which we have previously spoken. If the agricultural bureau at Washington, or one of our State Agricultural Societies would undertake this work and carry it successfully to its completion it would confer a priceless boon upon the graziers of our country.

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Classification of Grasses, Founded on their Habits and Localities.

The following classification of the grasses, founded on their habits and locations, which was proposed by Prof. Buckman, and published in the *Journal of the Royal Agricultural Society of England*, will usefully claim the attention of the reader, and can be easily retained in the memory.

1st. *Jungle grasses or bush grasses.* The plants belonging to this class find their appropriate and congenial homes in the equatorial regions, where, during one season of the year, they are drenched with incessant rains, and in the other are parched with fierce heat. In this region they frequently grow fifty or sixty feet in height. The common cane fishing poles are examples of this class. They fall far short of this elevation in this country; but even here, in the cane brakes of Florida, and the Red river they grow tall enough to excite the astonishment of a northern man who sees them for the first time. The grasses of this class, which are susceptible of being domesticated at the north, still retain their propensity to grow in bunches, not mixing kindly with other varieties, but growing in cushions or tufts, and refuse to form a turf. *Aira cæspitosa*, hair grass or hassock grass. *Avena pratensis*, or narrow-leaved oat grass, and *Elymus Europæus* or wood-lime grass, are well known examples of this class. Sheep's fescue, *Festuca ovina*, and orchard grass, *Dactylis glomerata*, when left to themselves, and without close feeding, manifest the same tendency.

An account is given of the Tussac grass, *Dactylis cæspitosa*, of the Falkland Islands, in the 9th volume of the *Journal of the Royal Agricultural Society*, which would lead us to believe that it will prove one of the most valuable varieties in this division, and might be possibly introduced with advantage into the salt marshes of this country as it has already been introduced into England. It grows to the height of seven feet, and in congenial soils to fifteen feet, and the culms are three-fourths of an inch in diameter; about 300 stalks grow in a single bunch, and the cushions attain to so great a height, in a succession of years, that a man on horseback can hide among them. The roots are sweetish to the taste, and will sustain life even in man. The cattle are said to eat it greedily, and they fatten readily upon it. It loves wet, peaty bogs, and is much improved where it can receive the salt spray of the sea, and is not injured by the drifting sands. It may be grown from the seeds, but more easily from suckers; one root planted on a space four feet square will soon cover the ground; it

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will certainly do so in three or four years if the situation is adapted to it Dr. Hooker says that plants of fifteen feet high, eight feet are occupied by the permanent Tussac and seven feet by the leaves, which have no trace of the hairs which are found on those of D. glomerata, but are particularly smooth and tender, and are evidently in the most grateful state for cattle food. Mr. W. Gorrie, in *Morton's Encyc. of Agriculture, art. Dactylis*, says that this grass is only found indigenous between the fiftieth and sixtieth degrees of south latitude; there it covers, with exuberant vegetation, lands which would otherwise be barren. It grows in the greatest perfection within a mile of the sea, and fully exposed to its influence. It flourishes on the deep spongy peat, where it is dry and firm enough to support the wild oxen and horses, which, as well as the numerous sea lions, seals, and sea wolves that cower beneath its luxuriant foliage, chiefly depend on the Tussac for support. It is there manured by decayed sea weed, and a kind of guano deposited by penguins, petrels and other sea fowls, which nestle and rear their young among its tufted roots. Healthy plants are occasionally seen much further inland, but only when accompanied by a similar guano deposit; and it is frequently found thriving in pure sand, in localities so near the sea as to have the benefit of an atmosphere loaded with saline moisture. It is well adapted for soiling, and for hay. Pigs should never be permitted to approach it as they injure the plants, by tearing up the leafy stems to get at their soft, juicy, lower extremities and nutty flavored roots. About the year 1845 this grass began to be naturalized in Scotland and its contiguous islands. At Tongue and Lochinver, in Sutherlandshire, on soils and situations similar to its native habitats in the Falklands, it has been introduced with the most successful results; the young plants having, in the second season of their growth, produced a succession of ripe seeds from the month of May onward to the end of autumn, from which the plantations of Tussac have been widely extended, and young plants are springing up spontaneously on the adjoining grounds. It is not improbable that this grass may prove a very valuable addition to the salt marsh grasses on our sea coast, and we hope that a fair trial may be given to it.. A very good representation of it is given in Fig. 15.

2d. *Aquatic grasses*, which, as their name implies are only found growing in the water as Indian rice, *Zizania aquatica*, which is found in great abundance in shallow waters on the Hudson and the Delaware rivers· or reed canary grass, *Phalaris arundinacea*, which is found chiefly in the edges of sluggish brooks. Hassock grass, *Aira cæspi-*

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tosa, is found growing in wet furrows or in the vicinity of defective drains. Some of these aquatic grasses, as we shall see hereafter, are of great value.

3d. *Marine*, or sea side grasses, which are chiefly found in the vicinity of the sea or of salt water, their roots being implanted in sand banks. These grasses are, for the most part, exceedingly coarse, and are so distasteful to cattle that they are only driven to eat them by starvation. Some species of the genus *Spartina*, however, are eaten, at certain seasons, by cattle, with a relish. A great proportion of the plants which are cut and cured by the farmers of New England and Long Island, and the Jersey coast, and known as salt marsh hay, are not grasses, but belong to other families of plants. As representatives of this class, we may cite *Spartina stricta*, salt marsh grass, and *Ammophila arundinacea*, beach grass.

4th. *The meadow grasses.* Most of the grasses known to farmers, and all of those which they most highly value, belong to this class. They compose the largest proportion of the plants in our best meadows and pastures. These will demand the largest share of our attention. It is hardly necessary to give examples, but we may cite *Agrostis vulgaris*, red top; *Phleum pratense*, timothy; and *Festuca pratensis*, meadow fescue.

5th. *The Agrarian grasses.*—This class embraces that section which are of little value for hay or for pasture, and are generally ranked among weeds, as enemies to be avoided rather than as friends to be welcomed. The representatives of this class are *Bromus secalinus*, chess, and *Lolium temulentum*, bearded darnel, which stands alone among the grasses as poisonous.

SCIENTIFIC CLASSIFICATION OF THE GRASSES.

Many schemes for the classification of the graminese have been proposed by botanists; but we propose to follow the arrangement of Dr. Gray for the reason, if there were no other, that his manual of botany is more generally used in this country and is most accessible to the majority of our readers. The generic characters are all taken from Dr. Gray, unless otherwise indicated.

Class—Monocotyledonous endogenous plants.—Stems with no manifest distinction into bark, wood and pith; but the woody fibre and vessels collected into bundles or threads, which are irregularly imbedded in the cellular tissue, perennial trunks destitute of annual layers, leaves mostly parallel-veined (nerved) and sheathing at the base, seldom separating by an articulation, almost always alternate or

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scattered and not toothed, parts of the flower commonly in threes, embryo with a single cotyledon (and the leaves of the plumule alternate.)

There is no way for the student to do but to take the thing described in his hand and patiently compare it with the definition given until he distinctly sees the application of every part of it. He must, therefore, take a corn stalk or some other monocotyledon and study its structure until he has made out every statement in the definition above given. He will then take one of the hollow grasses, a stalk of timothy for example, and study that until he perceives that all parts of the definition cover that as well as the corn stalk. We give a vertical and transverse section of a young endogenous stem, showing the curving of the fibres, in Fig. 16; and to enable him to compare this with exogenous structure, we give, in Fig. 17, an illustration of the soft maple magnified, showing the cellular pith surrounded by the wood, and the latter inclosed by the bark. Fig. 18 is a more magnified slice of the same; *a* is a part of the pith; *b*, vessels of the medullary sheath; *c*, the wood; *d d*, dotted ducts in the wood; *e e*, annular ducts; *f*, the liber, or inner fibrous bark; *g*, the cellular envelope, or green bark; *h*, the corky envelope; *i*, the skin, or epidermis; *k*, one of the medullary rays seen on the transverse section.

We will now endeavor to explain the words used in the definition of the class which are not in common use. *Endogenous plants:* This means literally *inside growers;* it is used in contradistinction to *exogenous* plants, which are *outside* growers. All the plants in the vegetable kingdom grow in one of these two ways; either from within outward, when they are called endogenous; or the increase is by successive new layers placed over the outside. Each of these modes of growth is accompanied by certain peculiarities of structure, which are exhibited and may be compared in Figs. 17 and 18. *Monocotyledonous:* This is a plant having a *single* cotyledon. All endogenous plants have embryos that bear only one cotyledon; hence all endogenous plants are also monocotyledonous plants, and they may be characterized by either appellation. The seeds of all plants wrap up within themselves the elements of another plant like themselves. This miniature plant is called the *embryo.* It consists of a *plumule*, which by future growth becomes the stem or ascending axis; the *radicle*, which becomes the root; and the *cotyledons*, which are the rudiments of the leaves. Besides the embryo, the seeds contain a sufficient amount of food to supply the young plant until it is sufficiently developed to

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provide itself with the nutriment stored up for it in the soil and in the atmosphere. Fig. 19 is a kernel of Indian corn split vertically so as to show these several parts; *c* is the cotyledon; *p*, the plumule, *r*, the radicle. The dotted portions of the figure show the albuminous and starchy matter, which is the food stored up for the use of the young plant. The left hand portion of the figure is the embryo. The cotyledons are more clearly represented in Figs. 20, 21 and 22, which represent the embryo of the sugar maple, as it is coiled up in the seed, and as they gradually develope themselves; *a* is the radicle, and *b b* the cotyledons, or seed leaves. This is a dicotyledonous plant, and has two seed leaves; the grasses being monocotyledonous, have but *one* seed leaf.

Order—Gramineæ.—We have already fully defined this order, and it is therefore unnecessary to repeat it here.

Tribe 1—*Poaceæ.*—This tribe is not distinguished by the number of its flowers. Some of its included genera have only one flower. Some have five, and one (*eragrostis*) has in some of its species as many as seventy flowers. But when there are more than one flower, their development is always centripetal; that is, they begin to flower at the base and subsequently at the top. The uppermost, if any, imperfect or abortive. Flowers are said to be *imperfect* when either the pistils or stamens are absent; *abortive*, when they are incapable of reproduction from any cause. The remaining flowers of the spikelet are all alike (perfect or occasionally moncœcious or dicœcious). In a few exceptional cases the lowest of the several flowers are less perfect than the highest, viz: staminate only, in Arrenatherum and Phragmites, neutral in Uniola, Ctenium, &c.

Sub-tribe—Oryzeæ.—In this the spikelets are all one-flowered in panicles. The flowers are often *monœcious;* that is, the stamens and pistils are on separate flowers, but on the same root and the same plant. The glumes are either wanting entirely or abortive. The inner palea is three-nerved. It has two squamulæ. See Fig. 7, where the squamulæ are marked as scales. The stamens vary from one to six in number.

This sub-tribe includes two genera.

1. *Leersia.*—Trivial names, false rice or white rice.—The spikelets in this genus are all single-flowered, as indeed they must be to bring them within the sub-tribe oryzeæ. They are perfect, flat, and are crowded in one-sided panicled spikes or racemes, which are more or less imbricated over each other, jointed with the short pedicels. The glumes are wanting. The paleæ are *chartaceous.* (That is, their text-

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ure is like that of paper or parchment.) They are much flattened laterally. They are boat-shaped, awnless, bristly ciliate on the keels, closed; nearly equal in length; but the lower is much the broader of the two, and incloses the flat grain. The stamens vary in number from one to six. The stigmas are feathery. Their leaves are branching. The flat leaves are rough upward, being clothed with very minute hooked prickles. The genus was named after *Leers*, a German botanist, and has three species growing in this country.

1. *Leersia oryzoides.* This species is variously known as rice grass, cut grass, false rice, white grass, and prickle grass Its panicle is diffusely branched and often sheathed at the base. The spikelets are flat, rather spreading in flower, and are from two and a half to three lines in length. The stamens are three in number. The palese are strongly and bristly ciliate, and of a whitish color. They are rough and dotted on the sides. The lower valve is three-nerved; the upper one-nerved. The keel is ciliate, with small spines. The leaves are from two to three lines wide. The ligule is short and *retuse.* (That is, a shallow, rounded notch at the end.) It grows from one foot to three feet high, and blossoms in August and September. Fig. 23 is a panicle of L. oryzoides reduced in size; Fig. 24, a branchlet of the same, with its spikelets of the natural size; Fig. 24a, an open spikelet in flower enlargod.

This grass is found, we believe, in all parts of the United States, but in the northern States we have never seen it eaten by cattle; but we have been informed that they do eat it sometimes when they can obtain nothing better, though we should suppose the rough spines with which it is covered would lacerate the lips of the animals when they crop it. We have been informed by southern gentlemen that it is valued there and is sometimes cultivated and made into hay, which is esteemed there as quite valuable. We are not aware that any analysis has ever been made of it.

At the north it is chiefly valued as an indication of wetness near the surface, as it is only found in wet places. Its color differs from most other grasses, being yellowish. It is mostly found in hollows, where the water has stood in the spring and early summer. In some positions it loses its yellowish hue and becomes of a more vivid green.

2. *Leersia Virginica.* White grass; small flowered white grass; Virginian cut grass. This grass may be discriminated from the preceding by observing that the panicle is simple, and that the spikelets are closely appressed, while the other is diffusely branched and the spikelets are spreading. This grass has only two stamens, while the

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other has three. The paleæ are much less hairy. The culm is from two to four feet high. The glumes are bent around and partly embrace the rachis, and are covered with minute impressed dots. It is found in swamps and wet shady woods, chiefly in the latter.

The following measurements of an average specimen may perhaps be useful: Culm, measured from the ground to the top of the panicle, 34½ inches; the panicle, 4½ inches long. It consisted of three single branches and a terminal spike. The lower branch measured 1¼ inches; the second branch 1¼ inches; the third branch, ¾ inch; the terminal spike, 1 inch; length of spikelet, $\frac{3}{16}$ inch; from the base of the panicle, measured downward to the base of the upper leaf, 2½ inches. The upper leaf was 2½ inches long; the next leaf below the upper one, 3⅞ inches long, and ½ inch wide; the next leaf below this (third from the top), 4½ inches long, a branch with 2 leaves comes out from its axil; the next lower leaf (fourth from top), 3 inches long; the next lower leaf (fifth from top), 4¼ inches long; the sixth leaf from the top was broken off. A branch 22 inches long comes out from the joint below the fifth leaf, and one 23 inches long comes out at the sixth leaf.

3. *Leersia lenticularis.* Fly-catch grass. This may be distinguished from the two preceding species by the difference of the spikelets, which in them are narrowly oblong, while in this they are broadly oval and imbricately cover each other. The paleæ are very flat, and are said to close and catch flies; hence its trivial name. It has two stamens. It grows, like the others, on low, wet grounds, and is found in Virginia and Illinois, and southward. The farmer may always rid himself of the members of this genus by thorough drainage.

2. Zizania. Water rice, Indian rice, wild rice.

An ancient Greek name of some grass, supposed to be *Lolium perenne.* Flowers monœcious, the staminate and pistillate both in one-flowered spikelets in the same panicle; glumes wanting or rudimentary, and forming a little cup; paleæ herbaceous membranaceous, convex, awnless in the sterile spikelets, the lower tipped with a straight awn in the fertile ones; stamens, six; stigmas pencil-form; spikelets jointed with the club shaped pedicels, very deciduous; large and often reed-like water grasses. There are two species of this genus.

1. *Zizania aquatica.* Tuscarora rice, water oats, Indian rice.

Lower branches of the ample pyramidal panicle staminate, spreading; the upper erect; pistillate; pedicels strongly club shaped; lower paleæ long awned, rough; styles distinct; grain linear, slender, half an inch long.

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We have copied Dr. Gray's description of this genus and species, which, like all that he gives, are most excellent; but the student will not recognize this readily without the necessity of a minute comparison of the plant with the description. It is found in great abundance on the banks and shallows of our fresh water rivers, and has a beautiful appearance in the month of August, when it is in full blossom. It grows in great profusion on the Hudson and Delaware rivers, especially on those portions which are just covered at low water. It is generally larger and more vigorous in places where the tides ebb and flow. We have often found it twelve feet high in these positions, though in the swamps at Whitehall, at the foot of Lake Champlain, we have measured culms which were nine feet in length. It is the only grass which exhibits brilliant colors. In early August the paleæ of the staminate flowers are richly colored with a very clear crimson, and the stamens are a very vivid and almost dazzling yellow. The contrast of these reds and yellows with the soft apple green of the culms and leaves is very pleasing. There is no difficulty in seeing that the panicle is divided into two very distinct parts. The lowest branches generally are included in the sheath of the leaf; they are long and spread out widely, giving out secondary branches from very near to the point where they join the rachis. The crimson paleæ are borne on the extremities of the pedicels, which are *clavate;* (*i. e.*, club shaped, largest at the upper end.) The staminate flowers which are borne on the lower spreading branches fall off very soon after ripening. The upper portion of the panicle bears branches which are closely appressed to the rachis, and bear pistillate or fertile flowers; the pedicles of these are strongly nerved and broadly clavate, about an inch long. The fertile flowers are racemed; the paleæ are unequal, rough and purplish, and bear long awns; the lower one is the longest, and is three-nerved; the scales are lanceolate. The paleæ of the staminate flowers are awnless; they are nearly equal in length, and about half an inch long. The leaves are flat, and from two to three feet long, and from half an inch to more than an inch wide. The Zizania is sometimes found in brackish waters, but its favorite haunts are in fresh waters. The Indians are very fond of the grain, and store up large quantities of it in October, when it is fully ripened. They gather it by beating it off into their canoes as they paddle through it. But the Indians are not the only customers for it. The reed birds (*Emberiza oryzivora*) resort in countless numbers to the muddy shores of our tide waters when this grass is ripe, and fatten upon the seeds. The rail (*Ortygometra novebora-*

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censis) also resort to it in great numbers and fatten freely upon it. The culms when chewed are sweeter than those of any other grass. We have often wondered why cows were not allowed to pasture upon it, especially in the fall of the year. Whenever they do get a chance to feed upon it, they show it in the increased flow and the increased richness of the milk. It is especially adapted for soiling, and can be procured with quite as little trouble as hay can be from most of the salt marshes from which it is taken. Nothing has ever been done by science or art to improve this grass which seems to have so many elements of value, but we think such experiments are well worth making. Pinkerton, long ago, said: "This plant seems to be designed by nature to become the bread corn of the north;" and Prof. Burnett, in his great work on botany, tells us that, "although not yet much cultivated, it has all the natural capabilities to become a valuable corn." He also says that it has been acclimated in England, and grows freely both in Middlesex and Rosshire. The most hopeful mode of trying the experiment would be to sow the seeds on lands which can be flooded at pleasure, and from which the water could be excluded whenever it might be desired. This experiment, well made, would doubtless suggest other and better ones, which would be decisive of the question.

I subjoin measurements of the various parts of an average culm grown on the Hudson river: The culm, from the ground to the upper extremity of the panicle, measures 6 feet, 8½ inches; panicle, 21 inches long; the pistillate part of the panicle, 11 inches long. The staminate part of the panicle has 6 whorls of branches. The lower whorl has 5 branches; the rest have 3 branches. The longest branch of the lower whorl measures 4½ inches; the next longest is 4 inches; the next 3½ inches; the next 2⅞ inches; the next 1¼ inches. The staminate spikelets are ½ inch long; length of pistillate spikelets 2½ inches. The culm is compressed at the base, the long diameter being ½ inch and the short diameter $\frac{7}{16}$ inch. At the base of the panicle the culm is quite round, and is $\frac{3}{32}$ inch in diameter. The lowest leaf is 18½ inches long; the second above, 28 inches long and ½ an inch wide at the base, and much thickened in the middle; third leaf, 23¼ inches long and 1 inch wide; fourth leaf, 10 inches long and 1 inch wide. Ligule of upper leaf $\frac{5}{16}$ inch long; lanceolate. Distance from base of upper leaf to base of panicle, 4⅝ inches.

2. *Zizania miliacea.* This species can be easily discriminated from the preceding, by observing that the staminate and pistillate

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flowers are intermixed, and that in the former they were separated. Also, that the awns are short, but long in Z. aquatica. It flowers in August. The leaves are not flat, but *involute* (that is, rolled inward from the edges). Grows in Pennsylvania and Ohio and southward.

Sub-tribe 2, AGROSTIDEÆ.—Spikelets one-flowered, perfect, occasionally with the rudiment or abortive pedicel of a second flower above, panicled, or the panicle sometimes contracted into a cylindrical head or spike, stamens one to three. This sub-tribe includes ten genera. The two following genera are grouped together, and are known as PHLEOIDEÆ, having the following characters in common: Glumes equal, strongly keeled, laterally flattened, boat shaped, somewhat herbaceous, as well as the paleæ. Squamulæ two, grain free, inflorescence densely spiked. The remaining members of the sub-tribe are grouped together as the TRUE AGROSTIDEÆ, having the following characters in common: Glumes equal or often unequal, concave or keeled, membranaceous. Paleæ membranaceous (except in part of No. 12). Squamulæ two, grain free, inflorescence panicled, open, or often contracted (glomerate), but not strictly spiked.

3. ALOPECURUS. Foxtail. Meadow foxtail.—The spikelets in this genus are one-flowered. It takes its name from the Greek *alopex* a fox, and *oura* a tail, in allusion to the form of the spike. The glumes have two valves, they are boat shaped, and strongly compressed and keeled, the two valves are nearly equal in length and are united at the base, equalling and sometimes exceeding the lower palea, which is awned on the back below the middle; it is membranaceous and its margins are united below. The upper palea is wanting. It has three stamens. The styles are mostly united. The stigmas long and feathered. The panicle is contracted into a cylindrical and soft, dense spike.

This definition of the genus is illustrated by Fig. 25, which shows the glumes; Fig. 26, the palea, awn and stamens; Fig. 27, a complete spikelet; Fig. 28, the palea seen from the inside; Fig. 27 is of the natural size, the others are magnified. This genus has three species here.

1. *Alopecurus pratensis.* Meadow foxtail. In this species the spikelets are one-flowered, on very short branches; the culm upright and smooth, from two to three feet high; the leaves smooth and flat, though the upper leaves are sometimes rough; the upper leaf is not more than half the length of its inflated sheath; ligule ovate and obtuse; glumes and paleæ both hairy, the latter about equal to the former in length; glumes *connate* (that is, united or grown together

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from the first) below the middle; the awn is twisted, and about twice the length of the palea; the spike-like panicle is from one to three inches long, of a yellowish green color, turning to a light greyish brown with age; root perenial and fibrous. This grass is distinguished from timothy, to which it bears considerable external resemblance, first, by the glumes which are awned and open without splitting in timothy, but are *without* awns and cannot be opened through their entire length without tearing in alopecurus pratensis; second, by the paleæ, which in timothy are two and *without* awns, but foxtail has only one palea which *is* awned.

Meadow foxtail is not a very common grass in the State of New York, but it would be a great improvement in our pasture lands. It is more common in Maine, as far as our observation extends. We are told by Mr. Goodale that in some places in that State it grows four feet in length, and is much esteemed there as a meadow grass. The greatest weight of hay on an acre, that we have seen recorded, is three tons, 125 pounds, but we have never seen any ourselves that would yield over one ton to the acre, and have never actually seen it growing over two feet long. It flowers in May, nearly four weeks in advance of timothy, and is one of the earliest grasses to start in the spring. Pastures well covered with this grass will afford a full bite at least one week earlier than those which do not have it. It does not flourish well in dry soils, but loves moist lands; no grass bears a hot sun better, and it is not injured by frequent mowings, on which account, as well as for its early verdure, it is valuable for lawns. Mr. Flint says, in his work on grasses, that it flourishes in the western part of Worcester county, Massachusetts, but it is nevertheless disliked there as a meadow grass, as it is very light in proportion to its bulk. It loses about seventy per cent of its weight in drying. It thrives best on rich land which is not too wet, low meadows and boggy grounds which have been drained are best suited for it. It appears, from the Woburn experiments, that its produce is nearly three-fourths greater on a clay loam than on a sandy soil, and that the quantity of nutritive matter is also greater in the proportion of three to two. Mr. Sinclair states that the proportional value in which the grass of the latter-math exceeds that of the flowering crop is as four to three; and Mr. Parnell infers that the loss sustained by cutting this grass at the time of flowering is considerable, which is not the case with most grasses. This fact and the inference founded upon it greatly needs verification before the truth of it can be admitted. It does not give a very good crop until the fourth year after the seeds are sown, hence it

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is not well suited to alternate husbandry. It is the principal grass in most of the rich natural pastures of Great Britain. Its limit of altitude is about 1,500 feet above the level of the sea. It is found native in Lapland, Norway, Sweden, Denmark, Russia, Holland, Germany, France, England and Italy, but is not a native of this country, having been introduced here from Europe.

According to the analysis of Mr. Way it contains much water in its composition. One hundred pounds of this grass gives only nineteen and three-quarter pounds of dry hay, while timothy gives forty-two and three-quarter pounds for the same weight of green grass, and the dry hay of foxtail contains less than half the nutriment that is contained in the dry hay of timothy. If timothy hay is worth ten dollars a ton, and the chemical results afford anything like a reliable guide to their relative values, the hay of foxtail grass would be worth four dollars and fourteen cents.

Mr. Way's analysis gives the following figures for meadow foxtail: Water, 80.2 per cent; albuminous or flesh forming principles, 2.44 per cent; fatty matters, 0.52 per cent; heat producing principles, sugar, gum, starch, 8.59 per cent; woody fibres, 6.70 per cent; mineral matter, 1.55 per cent. The seeds of this grass are high in price and very difficult to procure. They only weigh five pounds to the bushel, and an ounce has 76,000 seeds. A large proportion of the seeds are destroyed in the spike by the larvæ of a species of *musca*, the name of which Mr. Curtis says he has never been able to ascertain. It is also subject to a blight, and from these two causes it often happens that not a single seed sown will vegetate. Its culm and leaves are sometimes preyed upon by the *aphis avenæ* and the *aphis dirhoda*. When it is desired to secure the seeds of this grass, the first growth of culms should be allowed to stand for this purpose, as they bear much better seeds than the later growth. This grass is often very highly recommended for meadows in our agricultural papers by correspondents. When inquired into it will generally be found that these recommendations come from those who either live in sections of the country, which are very well adapted for its production, or from those who are not acquainted with superior varieties. Its recommendations are, that it is found in abundance in some of our very best meadows, here and in England; it is very permanent, one of the first to start in the spring, and the first to mature its seeds; it is exceedingly relished by cattle and may be pastured until quite late in the spring, and if the cattle are then withdrawn, the seed culms will spring up and yield a crop of hay.

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But whatever doubts may exist with respect to its value for meadows, there can be none about its value as a pasture grass; it is admitted on all hands that for this purpose it has no superior. Its early start in the spring, the quickness with which it renews its leaves after being cropped, and its great sweetness will always make it popular with all who are acquainted with it, and we hope that dairymen will hasten to make its acquaintance. We know little from personal observation of the other varieties, and the little that we know from books and oral intercourse about them, is hardly worth the telling. We shall, therefore, content ourselves with a simple botanical description of them.

2. *Alopecurus geniculatus.* Culm *ascending* (that is, rising obliquely from the ground), bent at the lower joint. It is distinguished from *A. pratensis*, by the awn which in the former projects only half its length beyond the palea, while in the latter it projects nearly twice its length beyond it. 2d. By the palea which in *A. geniculatus* is shorter than the glume, but in *A. pratensis* is equal to it. 3d. By the upper leaf which in *A. geniculatus* is as long as its sheath, whereas in *A. pratensis* it is only half the length of the sheath. 4th. When the palea of *A. geniculatus* is opened and flat, it is obtuse, slightly notched in the center with four rather indistinct green ribs, tinged with purple at the summit; but in *A. pratensis* when the palea is similarly opened, it has a conical form with four broad, distinct green ribs. The glumes are more obtuse than in *A. pratensis*. It has a creeping rhizome and grows in wet meadows, from twelve to eighteen inches high. The ligule is elongated. Leaves two to three inches long. It flowers in the latter part of June. We have rarely met with it, and we believe it is not common in any part of the United States. We believe it is worth little for agricultural purposes, as it is not relished by cattle, horses or sheep. It grows naturally around the margins of pools on a clayey soil. Its limit of altitude is 2,000 feet above the sea.

3. *Alopecurus aristulatus.* It is distinguished from the preceding species by the palea which is longer than the glumes, and by the awn which is shorter, and is hardly longer than the palea. The stem ascending, bent at the joints, *procumbent* (*i. e.*, lying on the ground without putting out roots) at the base. It flowers in the latter part of July, and if of any value it is not yet ascertained. It is found only in wet places and is commonly found on the margins of pools.

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4. PHLEUM. Catstail grass.—An ancient Greek name supposed to have been applied to Typha. The generic marks are: Glumes much longer than the paleæ; distinct; equal; boat shaped; awned or mucronate. The paleæ are awnless and *truncate* (*i. e.*, as if cut square off at the top.) The panicle much as in alopecurus, but denser and harsher. The styles are distinct. This genus has two species in the United States.

1. *Phleum pratense.*—Catstail grass; timothy; herd's grass (in New England), spike cylindrical elongated; glumes ciliate on the keel, tipped with a bristle or awn which is not more than half the length of the glume; three nerved; the root is perennial fibrous and sometimes bulbous; ligule ovate; the paleæ are not disclosed until the valves of the glume are pulled open; the lower one is the largest; it is five-nerved, and is somewhat toothed at the summit; the upper palea membranous, with the margins delicately fringed; it flowers early in July, and fruits in August; it has three stamens with purple anthers; it is found everywhere in the United States, and was introduced into cultivation in England from thence, but it is nevertheless pretty well settled that it is not a native of this country, but was originally introduced from Europe; it does not grow more than 1,500 feet above the level of the sea. The student cannot mistake the spike of *Phleum pratense* for any thing except *P. alpinum*, *A. pratensis* and *Setaria*. It may be distinguished from *P. alpinum*, by the length of its spike, which is twice as long as *P. alpinum*, and by the shortness of the awn of the glume, which is never more than half as long as the glume; whereas, in *P. alpinum* it is very nearly as long as the glume. It may be distingushed from Alopecurus in the way mentioned in the description of that genus, and from Setaria by the equal length of the glumes; in Setaria one of the valves of the glume is as long as the flower, while the other is not a quarter as long.

Timothy is our best known, most highly esteemed, and most extensively cultivated variety, but we are, nevertheless, most lamentably ignorant of many things with respect to it, which ought to be known before our knowledge can be said to be complete. The longest stalk of timothy that has come to our knowledge was raised by Rev. Charles Collins, of Montgomery county, Pennsylvania, and measured seven feet eight inches in length. It has been found many times six and one-half feet long. But the longest that we have ever *seen* was five feet three inches in length; its average length will vary from two to

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three feet. The longest spike we ever measured was eleven inches long; the average length of the spike is about five inches. We often find it, in poor meadows, with the culm one foot high, and the spike an inch and a half long. It has very little root foliage, relatively to other grasses; its chief value as a forage grass is in the culm and culm leaves. The heaviest crop of timothy in this country that we know anything of was raised by John Fisher, of Carroll county, in Maryland, who cut from one acre five tons 1,620 pounds of dry hay fit for the barn. The largest crop of timothy that we have ever actually seen, was on the farm of Hon. George Geddes, near Syracuse, who cut three tons of pure timothy on an acre. Fig. 30 illustrates the closed glume of *P. pratense*, magnified. Fig. 31, the paleæ, the inner palea being drawn out, and Fig. 32, a spikelet of the natural size. According to the experiments made at Woburn, timothy grown on a clay loam produced, when flowering, at the rate of 40,837 pounds (eighteen tons 517 pounds) of green grass per acre; which lost 23,481 pounds by drying, which was a little over half its weight; and its nutritive extract at the same period was equivalent to about 1,595 pounds per acre. When the seed was ripe, it was found that very little change had taken place in the weight of the undried grass, but the loss in drying then only amounted to about 21,440 pounds, while the nutritive extract had increased to 3,669 pounds, but it is stated that this gain was fully counterbalanced by the loss of the aftermath. We think, however, that this experiment must have been erroneously conducted, and ought not to be relied on in practice. It presents a very attractive appearance when in full flower, as shown in Fig. 33, which we copy from *Morton's Cyclopedia of Agriculture*; *a* represents the *open* glumes with paleæ raised out of them. The average production of hay from timothy meadows does not exceed one and a quarter tons to the acre. In view of the great crops which Mr. Fisher and Mr. Sinclair gathered, our demand for doubling the hay crop does not seem to be an extravagant one.

According to Mr. Way's analysis, timothy contains of water, 57.21; of albuminous or flesh-forming principles, 4.86; fatty matters, 1.50; heat producing principles (starch, gum, sugar, &c.), 22.85; woody fibre, 11.32; mineral matters, 2.66. Of the 22 varieties of grass which Mr. Way experimented upon, this contains the greatest amount of nutritive matter. But it must be borne in mind that he did not analyze either *Poa compressa* or *Poa serotina* which, judging from limited practical trials, we should think would equal, if they did not

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surpass it. We, unfortunately, have had no practical trials of its value, for milk and beef, tested by the scales; yet we think we hazard little in saying that the practical judgment of farmers will ratify the conclusions of Mr. Way; most of them are very fully convinced that cows fed upon it will give more butter and cheese; that oxen fed upon it will yield more and better beef; and that sheep will thrive better upon it, and give an evener and firmer fibre of wool than when fed on any other species of grass.

The great drawbacks to its utility, as a permanent meadow grass are, the small amount of aftermath that it produces, its liability to run out after two or three years, and the liability to injury from insects with which it is infested, and which, unfortunately, seem to be on the increase.

One of the causes of its running out is not generally understood by farmers, and should be clearly stated here. Timothy is found with two kinds of roots. Sometimes they are fibrous, as in Fig. 8. In other cases they are bulbous, as in Fig. 9. Many authors have considered that these two kinds are clearly two different species; but as there seems to be no other perceptible difference, the distinction of species has not generally been recognized by botanists. In the bulbous variety the plant renews itself by an annual formation of bulbs, or perhaps it would be more correct to say of tubers, in which the vitality of the plant is collected during the winter. From these bulbs proceed the stalk, leaves and roots; hence when the former perish the latter cannot be looked for. These, like all other tubers, receive their growth and nourishment, not directly from the roots, but from matters which having been elaborated in the leaves, are returned to, and stored up in its recesses. The completion of their nutriment is indicated by the drying up of the culm in the neighborhood of the first and second joints. If the stem is cut before this yellow spot appears, the tuber is immature, and the plant will make an effort to repair the injury by sending out lateral tubers; but unless the plant is unusually vigorous, these shoots will be feeble, and the stem springing from them sicken. Either the cold of the winter or the heat of the summer next ensuing will be almost sure to kill them. When the tubers are allowed to come to maturity and one of the lower joints is allowed to remain in contact with it, they will remain fresh and vital during the winter months; but if the green portion is severed near to the bulb at any season of the year, the root will perish. Thousands of dollars are lost annually by neglecting this simple principle. Either the grass is shaved by the scythe down to the bulb or

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cattle are allowed to run in the meadows until late in the autumn, and thus destroy the timothy. The timothy plants having fibrous roots, will bear more severe cropping and close cutting; but are more likely to be frozen out in winter. Nothing can show more clearly the evils arising from our ignorance of the habits of the grasses than this persistent sacrifice of our most valuable species of grass. Mr. Flint, who discusses this subject with much ability, educes the following inferences from the principles just laid down:

1st. That timothy grass cannot, under any circumstances, be well adopted for pasture, as the close nipping of horses and sheep is fatal to the tubers, which are also extensively destroyed by swine if allowed to run in the pasture.

2d. All attempts at shaving the sward should be avoided while using the scythe, and in gauging mowing machines care should be taken to run them high enough to avoid cutting below the joint.

The proper time for mowing timothy is just when the first dry spot appears above the first joint, which will correspond with the period when about half the blossoms have turned brown and the upper portion of the spike is still purple. If mowed before, as we have just seen, the plant is injured. If left to a later period, the starch and sugar are converted into indigestible woody fibre, and the nitrogenous compounds upon which its value chiefly depends are transferred from the leaves and culms to the seeds, which mostly drop out before they reach the manger, while those that are swallowed are not masticated, and therefore pass through the alimentary canal without affording any of their nourishment to the animal. We have remarked that most farmers concur in their testimony to the value of timothy as a hay crop. There are, nevertheless, many dissentients who say that their experience teaches them that it is very little better than oat straw for the nourishment of their animals. Both of these opinions are strictly correct; but we have always found that those who entertain so poor an opinion of it are those who let it remain uncut until it is over ripe, and therefore worthless. We have tried this over and over again with uniform results. Where the grass had been cut when over ripe, the milk of cows fed upon it would diminish, and their coats would grow rough; but when this was replaced by food that was cut green and put into the barn without being wetted, we have always found that the cows gained in their milk and their coats would resume their soft and silky appearance. We have tried this so often and seen it tried by others with the same results, that we do not hesitate to assert with perfect confidence that the rule given above is

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the true one, and ought to be observed by every owner of stock. It is often alleged that timothy is a great exhauster of the soil, and the allegation is doubtless perfectly true. All crops exhaust the soil very nearly in proportion to their value. A crop that does not exhaust the soil is not worth gathering. No farmer is worthy to reap a good crop who is too niggardly to supply it with the necessary food. It is high time that the idea of getting something for nothing was banished from the farmer's mind. We can assure them, however, that there are no machines which will convert manure into more valuable nutritive materials than the grass under consideration. Many of the grasses are shy bearers of seed. With some of them an acre of grass will scarcely produce seed enough to sow an acre of land. This is not the case with timothy. It is one of the surest and most abundant bearers of sound seeds in the whole catalogue of grasses; and in view of the frauds and adulterations practiced in the sale of seeds, it would be a sound economy if farmers would give more attention to saving their own. Since the invention of the mowing machine this can be much better and more cheaply done than it it was formerly. The machine should be adjusted to cut off the heads not more than two inches below the bottom of the spike, and care should be taken to thrash them as soon as possible after cutting.

One of the chief causes of the non-vegetation of seeds is their heating and becoming mouldy in the mow, which destroys their vitality. They should remain spread out on the thrashing floor until they become thoroughly dried, turning them over every day. With these precautions farmers will never be disappointed in the germination of their seeds. They ripen toward the end of July and weigh about forty-four pounds to the bushel. Timothy is not well adapted to hot sands, dry gravel, especially when hilly, nor for chalky soils, nor for hard, sterile clays. When it grows at all on the latter it will be found to be of the bulbous variety. It thrives best on peaty, damp soils, and especially on moist, calcareous loams, when it exhibits its greatest perfections, and is in such situations generally found to be fibrous rooted. In the present state of our knowledge we regret to say that we cannot tell the precise composition of the soils best adapted for its growth. The following measurements of phleum pra tense are from a culm considerably larger than the average size: Culm four feet one inch from the ground to the top of the spike, length of spike three and three-quarter inches, distance between the base of the spike and the base of the upper leaf eight and a half inches, upper leaf five and three-quarter inches long, its ligule one-

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quarter inch long. The next leaf below it was nine and three-quarter inches long, the third leaf nine inches, and the fourth leaf six and three-quarter inch long. The upper leaf and the next lower one were eaten in oval patches by insects. Two stools came out from the base both nine and a half inches long. The lower leaf on each was six and three-quarter inches long.

2. *Phleum alpinum*, as its name imports, is usually found on mountains, though it is sometimes found on the table lands of the Adirondacks. We have already given the modes of distinguishing this from the preceding species. It is rarely found lower than 2,000 feet above the level of the sea. Fig. 33 (*a*) shows a culm of *P. alpinum;* Fig. 33 (*b*) the glumes; Fig. 33 (*c*) the paleæ.

5. VILFA.—Rush grass. This genus is one-flowered, and its panicle is either spiked or contracted. The glumes are *carinate* (*i. e.*, having a ridge on the back like the keel of a boat), the lower one being the smallest. They are one-nerved or nerveless, and without points or awns. The paleæ, much alike, and are of a membranaceous, chartaceous texture. They are neither awned nor *mucronate* (*i. e.*, having a small, abrupt, terminal point). The upper one is *bicarinate* (*i. e.*, two-keeled), longer than the glumes. The lower is one-nerved, rarely somewhat three-nerved. Stamens, usually three. Stigmas, simply plumose. Grain, oblong or cylindrical, deciduous. Culms, wiry or rigid. Leaves, involute; usually bearded at the throat; their sheaths often inclosing the lateral panicle. It includes three species, none of which are of much agricultural importance.

1. *Vilfa aspera.*—Root perennial. Panicle contracted, spiked, partly exserted (*i. e.*, projecting out) from the uppermost sheath, spikelets two to three lines long, glumes lanceolate, one-nerved, unequal. Paleæ much longer than the glumes, smooth in the upper part, hairy below. The paleæ vary greatly in their proportions. The upper is sometimes acute, and in other cases obtuse, sometimes twice as long as the lower, while in some plants the lower one is the longest. The culms are from two to four feet high. The lower leaves are from one to two feet long and about two lines wide below, and taper to a long thread-like extremity, which is often recurved, involute, very rough on the margin. The sheaths are bearded with long, whitish hairs at the throat. It flowers in September. It is found in sandy hills and fields; rare at the north, but more common southward.

2. *Vilfa vaginæflora.*—This differs from the preceding in that its root is annual. The glumes are nearly equal. The paleæ are nearly as long as the glumes. The panicle oblong; few flowered; the

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branches alternate, or in pairs; one to two-flowered. The lateral ones concealed in the sheath; the terminal ones exserted. Ligule wanting; culms slender, six to twelve inches high; leaves much smaller than the preceding; one to three inches long; hairy at the base; slender at the point. The stamens are three in number in the terminal panicle. They are minute or wanting in the lateral ones; anthers purple. It flowers in September, on sandy, arid fields, and barren hill sides, and is more frequently met with than No. 1. Fig. 33 (*d*) an enlarged spikelet of *V. vaginæflora*. Fig 33 (*e*) the same, fully opened.

3. *Vilfa Virginica.*—This is distinguished from the last by its perennial root, by having its panicle more numerously branched, and by its spikelets being more numerous and slender. It grows on the sandy sea shore of Virginia and southward.

Although none of the species of this genus are very valuable for hay or pasture, yet they deserve attention as growing on land so sandy that no other kinds will grow upon it, and are certainly better than nothing. We have no analysis of them, and it must be confessed that we are blindly ignorant of nearly all that we ought to know about them. We hope some of our readers will make some experiments upon them and communicate the results to the public.

6. SPOROBOLUS. Drop seed grass. Fig. 33 (*f*) a spikelet of *S. cryptandrus*, magnified. Fig. 33 (*g*) the same, with the flower open, and the paleæ raised above the glumes. Fig. 33 (*h*), the fruit, showing the seed loose in the utricle. The spikelets of this genus are one-flowered (rarely two-flowered) in a contracted or open panicle. Flowers are nearly as in the genus Vilfa; the glumes unequal; paleæ longer than the glumes; stamens two to three. The grain is a globular utricle (hyaline, or rarely coriaceous), containing a loose seed, deciduous (whence the name *spora*, seed, *ballo*, to cast forth). This genus includes five species.

The glumes of the three following species are very unequal; the panicle is pyramidal and open.

1. *Sporobolus junceus.*—Spikelets from one to two lines long, and have a shining appearance. The glumes are ovate, rather obtuse, the lower one-half as long as the upper one equalling the nearly equal paleæ. The culms grow up from one to two feet high. The leaves are involute, narrow, rigid, the lowest elongated. Panicle narrow and loose. It grows on dry soils in Pennsylvania and southward, and flowers in August.

2. *Sporobolus heterolepis.*—Spikelets about one line long or a little

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over. Panicle loose, branches capillary. Glumes unequal, the lower one, three-nerved, reddish, awl-shaped or bristle-pointed from a broad base. The upper tapers to a sharp point and is nearly as long as the equal paleæ. Paleæ reddish, keeled, obscurely three-nerved; culms from one and a half to two and a half feet high; leaves involute, thread-form, rigid. The lower leaf is said by Prof Gray to be as long as the culm, but we have never seen any as long as this. We have a specimen, labelled by Dr Sartwell, in which the lower leaf is not more than half the length of the culm. The lower leaves hairy, the upper ones smooth; stamens three; anthers an orange red. Flowers in August. Ligule wanting. It is said to exhale an unpleasant odor like Eragrostis poaeoides, which can be detected at the distance of three or four feet, but we have never noticed it. Utricle spherical, shining, thick and coriaceous. It is found in dry soils in Connecticut, northern New York (especially about Watertown), Ohio and Wisconsin. It is often found growing on rocks.

3. *Sporobolus cryptandrus.*—Spikelets between one and two lines long, racemose; upper glume lanceolate, acute, as long as the equal paleæ, lower one about half as long as the upper; paleæ a little rough on the keel; stamens three; anthers yellowish; panicle pyramidal; culm one and a half to three feet high; leaves two to three lines wide, the upper ones extend above the panicle, which is of a dull leaden color; they are smooth on both sides, about two lines wide; sheaths pubescent along the margin, and densely bearded at the throat. Flowers in August. Is found on sandy soils on the banks of the Erie canal near Buffalo, at Ipswich, Massachusetts, in Illinois and southward. We have not seen this grass collected for hay, but it is very leafy, and might perhaps be profitably cultivated on sandy soils, such as those of Saratoga and south Jersey.

In the two following species the glumes are almost equal, shorter than the broad paleæ; panicle racemose, elongated, open; the pedicels capillary; sheaths naked at the throat; spikelets sometimes two-flowered.

4. *Sporobolus compressus.*— Spikelets one line long; glumes acute, keeled, purplish below, whitish above; paleæ nearly equal, awnless, about one-third longer than the glumes; panicle from six inches to one foot long; culms from eighteen to thirty inches high, stout and flat, tufted; sheaths flattened, much longer than the internodes; leaves erect, narrow, conduplicate channelled (*i. e.*, folded upon itself lengthwise, so that its cross section is like the letter V). It grows in boggy lands; there is abundance of it in the pine barrens

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of New Jersey, and in the coarse hypersthene sands of the Adirondack region. We have seen the sweet cold springs of that region environed by a belt of this grass which was as beautiful as anything that the eye could ever look upon. The delicate, glossy dark green culms and leaves, the panicles with their capillary branches stretching out in the most graceful curves, and the spikelets, delicate and fairy-like, mirrored in the bright clear waters, altogether make a vision of beauty which once seen can never be forgotten. The deer are very fond of this grass, and always stop to crop it when in the vicinity of their runways or drinking places. Its habit, when growing wild, is to form tussocks like orchard grass, with wide interspaces between them, which would not be profitable for meadows or pastures, but if this habit could be overcome, as it can in orchard grass, it might be a valuable addition to our grasses, especially in moist sandy lands. We have never seen it cultivated, however, and do not pretend to offer anything more than a conjecture of its value.

5. *Sporobolus serotinus.*—The extreme delicacy of the culms, leaves and spikelets of this grass is quite sufficient to distinguish it unmistakably from all other species; nothing so ethereal in appearance is found in woods or fields. The spikelets are less than a line in length, purplish. Culms somewhat flattened, from six to eighteen inches high; it has few leaves, which are channelled and very small. We need a finer term than capillary to describe the delicacy of its branches and pedicels, which are more like a dream than a reality. The glumes are thin, somewhat unequal, and are about half the length of the equal paleæ. It flowers in September, and is found in almost all parts of the northern States, in wet sandy places. Dr. Torrey states that it is often viviparous at the nodes, and that it is frequently found infested with ergot; but we have never happened to meet with it in either of those conditions. It can hardly ever be useful as a forage grass.

We now come to the true Agrostideæ, which have been defined above.

7 AGROSTIS, bent grass.

The name of this genus is derived from the Greek agros, *a field.* It may be identified by the following characters: Spikelets one-flowered, in an open panicle; glumes somewhat equal, or the lower rather longer; usually longer than the paleæ, pointless; paleæ very thin, pointless, naked; the lower three to five-nerved, and frequently awned on the back, the upper often minute or wanting; stamens chiefly three; grain free; culm usually tufted and slender.

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This genus has two subdivisions, the first, Trichodium, is characterized by the upper palea, which is absent, minute or abortive. It includes the four next following species:

The second, Agrostis proper, has the upper palea manifest, but shorter than the lower. This includes the two last species enumerated under the genus.

1. *Agrostis elata* (Taller Thin grass).—Spikelets one and one-half lines long, crowded on the branches of the spreading panicle above the middle; glumes rather unequal; paleæ awnless, slightly shorter than the glumes; culms firm or stout, growing two to three feet high; the leaves are flat, one to two lines wide, the upper ligules elongated, two to three lines long. Flowers in October, and is found in the swamps of New Jersey and southward.

2. *Agrostis perennis* (Thin grass).—Culms slender, erect from a *decumbent* (*i. e.*, leaning on the ground with the base only erect) base, about one or two feet high; the leaves are flat, the upper being from four to six inches long, and from one to two lines wide; the panicle is at length diffusely spreading, pale green, the branches short, divided and flower-bearing from or below the middle; the lower palea is awnless, though very rarely short awned, shorter than the unequal glumes, the upper minute or obsolete. It grows in damp, shady places, and flowers in July and August. We give Prof. Gray's description, of this and the preceding species, who is very accurate, and may always be fully trusted. We have never seen either of them growing, and do not have either of them in our herbarium. They are probably of little value agriculturally.

3. *Agrostis scabra* (Hair grass, Tickle grass).—The reddish spikelets are about one line long and are borne at and near the apex of the branches; the culm erect, smooth, slender, sometimes *geniculate* (*i. e.*, making an angle at the joint like a bent knee) at the base, from one to two feet high; the leaves are linear, the lower ones *involute* (*i. e.*, rolled inward from the edges) and are from four to six inches long, the upper ones flat, from one to three inches long; the glumes unequal, acute, lanceolate, about one and one-half lines long, hispid (*i. e.*, beset with rigid, spreading bristle-like hairs) on the keel; lower palea oblong, obtuse with several very short bristles at the base, about one-fourth shorter than the glumes; it is usually awnless, though it is sometimes furnished with an unconspicuous slender awn; the upper palea is either minute or wholly wanting; the panicle is very loose, the branches slender, brittle, hispid with trichotomous (*i. e.*, three-forked) divisions; the panicle has a dark red or purple color,

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it is most remarkable and unique, with its very divergent whorled branches, which are covered with minute bristles when seen under a lens. It is very much disliked by mowers, as the branches are very brittle and fly about, when trodden on, to a considerable distance, hence, when they are perspiring, it adheres to their legs and arms and causes intolerable itching. It has three stamens; anthers pale yellow; stigmas white, plumose. It is found in old fields and dried swamps, and varies very considerably in different soils and climates. It is very abundant in the Adirondack region of New York. In a large natural meadow formed by a beaver dam, at the base of Mount Colden, it constitutes about one-sixth of the grass. On Mount Colden itself, as well as on other mountains in Essex, it changes its appearance somewhat and is known as the variety *tenuis*. Cattle dislike it, and we know of no use for it, though no doubt it has its uses if we could discover them.

4. *Agrostis canina.*—Brown bent grass. Spikelets are greenish, about one line long, they finally turn brown or purplish; they are acute, and stand on pedicels about as long as the glumes. The glumes, Fig. 34, are nearly equal, lanceolate acute, the outer valve rough on the keel through its entire length, and without lateral ribs. The paleæ, Fig. 35, somewhat shorter than the glumes. The lower palea is narrowly lanceolate and rather acute, five-nerved, minutely toothed at the summit and slightly hairy at the base; it bears an awn rising a little above the base and extending about half its length above the summit, and is geniculate at the middle, sometimes, however, the awn is much shorter. The culm is from one to two feet high, slender and smooth, slightly decumbent at the base. It bears four or five leaves, with perfectly smooth sheaths; the upper sheath is much longer than its leaf, and is crowned with a long membraneous pointed ligule. The panicle is short, from three to five inches long; it is erect and spreading while in flower, otherwise close. The branches are very delicate, rough with minute teeth; arising from the rachis mostly in threes and fives. It is perennial. Flowers early in August. Grows occasionally in wet meadows, but is mostly found in mountainous regions. The soils most congenial to it are those which are poor, wet and peaty; it grows in detached patches and is seldom found in association with any other grass. It is shown in Fig. 36.

5. *Agrostis vulgaris.*—Red top. Herds grass in Pennsylvania, Burden's grass in New England. Fig. 37*A*, vulgaris; Fig. 37*a*, glume: Fig. 37*b*, paleæ, both enlarged.

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The spikelets of this widely diffused grass are about one line in length, generally of a reddish purple; they are numerous and glossy. Glumes nearly equal; the valves narrow and acute, without lateral nerves, the lower one minutely toothed through the *upper half* of the length of its keel; lower palea very obscure; three-nerved; mostly awnless; ovate; minutely notched on the summit; smooth at the base. Culm from one to two feet high; the longest we have ever measured was thirty-two inches high, erect, round, smooth, polished, bearing an oblong panicle of a brownish red, though sometimes of a pale green; it arises from the rachis in branches of threes and fives at nearly equal distances from each other; these branches divide, when they have reached about half their length, into others which bear the spikelets. The leaves are three to six, sometimes eight, inches long, scabrous, nerved, narrow, flat, rough on both sides, edges minutely toothed. The ligule, in every printed authority within our reach, is said to be short and obtuse, or truncate; it usually is so, yet we have a bunch of undoubted *A. vulgaris* before us now in which the ligule is three sixteenths of an inch long by actual measurement, and lacerated at the top; this specimen is from North Elba, in Essex county, on the clearing of John Brown, whose soul is now marching on. Flowers about the middle of July. At the first glance *A. vulgaris* may be mistaken for *Glyceria nervata*, or *Cinna arundinacea*. It may be distinguished from the first by observing that *A. vulgaris* is *single* flowered, while *G. nervata* is many flowered; from *C. arundinacea*, which is four or five feet high; flowers in August, and has spikelets three lines long, and only one stamen; but *A. vulgaris* is never three feet high, flowers in July, and its spikelets are not over one line in length, and has three stamens. There is considerable difficulty in distinguishing between *A. vulgaris* and *A. alba*. The most reliable distinction is afforded by the keels of the glumes. In the former the keel is toothed only on the upper half; in the latter, it is toothed through its whole length. In *A. vulgaris*, the ligule is generally short and truncated. In *A. alba* it is long and acute. Its seeds weigh about twelve pounds to the bushel. It is found abundantly in moist pastures and meadows. Two tons of hay, from this grass, have been grown on an acre; but one and one-fourth tons is the largest crop that we have actually seen weighed, it does not often exceed one ton to the acre. It is a very favorite grass in wet, swampy meadows, where its interlacing, thick roots consolidate the sward, making a firm matting which prevents the feet of cattle from poaching. It is generally considered a valuable grass in this country, though by no means the

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best one. Cattle eat hay made from it with a relish, especially when mixed with other grasses. According to the Woburn experiments it yielded, at the time of flowering, 10,209 pounds of grass, which lost in drying, 5,615 pounds, and afforded 532 pounds of nutritive matter. At the time of seed-ripening it yielded 9,528 pounds of grass, which lost exactly half its weight in drying, and only afforded 251 pounds of nutritive matter. It is greatly to be regretted that Mr. Way has given us no analysis of it. We know of no other analysis except that made by Prof. Emmons, at Albany, for the purpose of determining its mineral constituents. As a pasture grass it is much valued by dairymen and in their opinion the butter would suffer much by its removal. With us it is chiefly grown on wet, heavy lands. In England, on the contrary, it is considered as best adapted to dry sands, and the only commendation that is ever given to it is its ability to withstand severe droughts. Since its botanical characters are precisely alike in both countries, it is hard to understand why its habits should be so widely different. The English farmer is taught the best means of eradicating it, but never how to cultivate it. The only place where it is recommended to sow it there, is on rabbit warrens and the outskirts of blowing sands. Still, notwithstanding the pains taken to exterminate it, it yet maintains itself from high water mark on the sea shore, to the highest zone of gramineous vegetation. Mr. S. Howard, in the Transactions of the New York State Agricultural Society for 1855, says that there are two kinds of this grass. *A. vulgaris, major*, which we have just described, and *A. vulgaris, minor*, which is found scattered over Massachusetts and Rhode Island, but is chiefly found in the county of Plymouth, in the former State. The latter kind seldom grows more than one foot high, and may be recognized by its narrower leaf and darker green color. It yields a less bulk of hay, but is heavier in proportion to its bulk. Its hay is better relished by cattle, and is particularly adapted for feeding working oxen; it is much better adapted to dry soils than the other kind. We have often seen the grass described by Mr. Howard, in Plymouth county and in Rhode Island, but we have never been able to discover any real botanical difference between them; it is probable that the difference between them is due to differences of soil and climate, as it is well known that all the species of this genus are remarkable for their changes of form under these influences. This grass is shown in Fig. 37, where it appears to have a fibrous root, but it has in reality a creeping root. Measurement of *A. vulgaris*, somewhat larger than the average size; culm, 30 inches from the ground to the

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top of the panicle; panicle 7 inches long, which consists of seven whorls of branches; the lower whorl has seven branches; the central one is three inches, the two lateral ones two inches, the four intermediate ones vary from one and one-eighth inches to three-fourths of an an inch long. The next higher whorl has six branches; the central one is two and one-half inches, the two lateral ones two inches, the three intermediate ones from one and one-eighth to seven eighths inches. The next higher whorl has five branches; the next higher has also five branches; the two next have two branches each, and the next has one branch. The distance between the base of the panicle and the base of the upper leaf is three inches. The upper leaf is four inches long and three-sixteenths of an inch wide; its ligule one-eighth inch long and is four and one-half inches above the second or next lower leaf. The second leaf is four and one-half inches long. The third leaf four inches, and the fourth or lowest leaf is three and one-fourth inches long.

6. *Agrostis alba*, White bent grass.

This is in most respects, like the last, except that the color of its panicle is of a greenish white, or barely tinged with purple. Its ligule is long and somewhat ragged at the top. Its palea is furnished with a small tuft of short hairs (see Fig. 38), and the keel of its lower glume is toothed from the top to the bottom of its keel (see Fig. 39), both figures being magnified.

Agrostis alba has a very important variety known as *A. stolonifera*, and amongst English farmers as Fiorin. The branches of the panicles are densely tufted; the sheaths are roughish; the ligule long; stem procumbent at the base; root creeping, throwing out long procumbent smooth stems, which take root at their joints. It is found by the sides of ditches and wet places, and also on clayey soils near the sea. Flowers in July and August. It is most easily distinguished by the interrupted tufts of its panicles, as seen in Fig. 40, which represents *A. stolonifera*.

About the beginning of the present century, Dr. Richardson, of Portrush, in Ireland, created an intense sensation in the agricultural world by his publications respecting the great value of *A. stolonifera* on bog lands. It at once became as much the rage as the cultivation of *morus multicaulis* was here some years ago. Its long trailing stolons were, for want of seeds, chopped into pieces from three to six inches in length, which were scattered, in moist, autumn weather, on the surface of well prepared ground, and then lightly harrowed or rolled in. But its seeds can now be obtained in abun-

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dance, and this mode of propagation is no longer resorted to. The seeds weigh from thirteen to fifteen pounds per bushel.

Mr. Sinclair says that when grown upon an active wheat soil, it produced, at the time of flowering, at the rate of 17,696 pounds of grass per acre, which lost, in drying, 9,954 pounds, and yielded, of nutritive matter, about 968 pounds; while at the time of ripening its seed, it produced 19,057 pounds of grass, which lost, in drying, 10,481 pounds, and afforded 1,042 pounds of nutritive matter. It further produced 2,722 pounds of green aftermath; and a portion left uncut till December afforded at the rate of 20,418 pounds of grass, which yielded, of nutritive matter, about 1,436 pounds per acre. Its chief value seems to consist in its retention of verdure late in the fall, and even in the winter, until the earlier grasses leaf out. It is still extensively cultivated in England, but only in combination with other grasses. We find it rarely in our American grass lands, and it is well worthy of experiment on our wet, peaty soils, which may very probably be improved by its introduction. It further appears, from Mr. Sinclair's experiments, that *A. vulgaris* grew better on sandy than on clayey soils; that *A. alba* produced over three times as much as *A. vulgaris* on sandy and clayey soils, and more on the latter than on the former. The *A. stolonifera* produced more on the sandy soil than either of the preceding, but less than one-fourth as much on the clay as it did on the sand, for the first year, but the second year it produced three times as much on the clay as it did on the sand. These different forms of *Agrostis* evidently have very different agricultural values, and have been recognized by botanists as different species; but they are probably mistaken, as Prof. Buckman, of the Royal Agricultural College, at Cirencester, has produced them all from the same seeds, germinated under different circumstances of soil, climate and moisture.

8. POLYPOGON. Beard grass; name taken from two Greek words signifying much beard.

This genus is characterized by one-flowered spikelets, which contain a floret shorter than the glumes. Glumes nearly equal and long awned (Fig. 41, magnified), the awns twice the length of the glumes, and sometimes more. The floret consists of two paleæ (Fig. 42, magnified). The outer palea is about half the length of the glume; ovate, without lateral nerves, and is commonly armed with a short awn below the apex. The inner palea is rather shorter than the outer; thin and pellucid, with the margins entire; stamens, three; grain free. It has but one species.

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Polypogon monspeliensis.—The spikelets, glumes and paleæ have been described in defining the genus. Culm erect, round, slightly roughish to the touch. Leaves with smooth, striated sheaths, the upper sheath longer than its leaf, having a long, acute roughish ligule; the leaves are flat, rather broad, and roughish on both surfaces. Panicle compound, erect, dense and silky; from one and one-half to two inches long; its branches are rough; rachis nearly smooth. It can be readily distinguished from every other species of grass by its long glumes. It flowers in July and its seeds are ripe by the second week in August. It is found on the coast; Isle of Shoals, New Hampshire and other places southward; it is frequent on the Mediterranean sea, but does not exist farther north than latitude fifty-five. It is of no agricultural use. In England there is another species of this grass, *P. litoralis;* but we believe that there are no specimens of it found in this country. This is the grass described as *Alopecurus* by Theophrastus. Its application to the genus previously described was made under a misapprehension of his meaning. Fig. 43 represents its appearance, and also shows a spikelet detached of the natural size.

9. CINNA. Wood reed grass; name unexplained.

The spikelets of this genus are one-flowered, much flattened; crowded in an open flaccid panicle. Glumes lanceolate, acute, strongly keeled; hispid serrulate on the keel; the lower rather smaller; the upper a little exceeding the paleæ. Flower manifestly stalked in the glumes, smooth and naked; the paleæ much like the glumes; the lower longer than the upper; short-awned or bristle-pointed on the back below the pointless apex. Stamen one, opposite the one-nerved upper palea. Grain linear, oblong, free. It has one species.

Cinna arundinacea.—The spikelets and florets have been described in defining the genus. They are figured in Fig. 43*a* magnified and closed. Fig. 43*b* represents it open, displaying pistils and single stamens. The culm is simple and erect, from two to seven feet high. We saw it in one instance nine feet high, but this is very rare. The leaves are from three to five lines wide, bearing an elongated ligule. The panicle is from six to eleven inches long; somewhat secund (that is, one-sided, or where the flowers are all turned to one side), or nodding. The branches of the panicle arise from the rachis in whorls of four and five; they spread much when in flower, but are afterwards erect. The spikelets are green in some parts and tinged with purple in others. The general appearance of the panicle at a little

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distance is purplish; the anther yellow. It is perennial, and flowers in August and September. Rhizoma creeping. It is somewhat sweet scented, and is found in swamps, but mostly in moist shady woods. We have never seen cattle eat it, nor are we aware that it has ever been cultivated. There is a variety, known as *C. pendula*, in which the panicle is loose and more slender; the branches nearly capillary and drooping in flowers; pedicels very rough; glumes and paleæ more membranaceous than the former, less unequal; spikelets one and one-half to two lines long; upper paleæ obtuse. The use of this variety is as obscure as that of the main species.

The following measurements were made from a plant of the average size: Culm, five feet one and one-half inches; panicle, fifteen and three-fourths inches. It has fourteen whorls of branches; the lower whorl has three branches, the longest of which is four inches; the other two are four inches. The next three whorls have also three branches; the rest have two branches. Spikelets one-fourth inch long. Distance from the base of the panicle to base of upper leaf, five and one-fourth inches. The upper leaf is eleven and one-half inches long; the next lower one (second) thirteen and one-fourth inches long and five-eighths inch wide; third leaf (downward), twelve and one-fourth inches; fourth leaf, twelve inches; fifth leaf (lowest), eleven and one-half inches. The three lower leaves were broken off. The diameter of the culm at the base, three-sixteenths inch.

10. MUHLENBERGIA. Drop seed grass.—This genus was named in honor of Rev. Dr. Muhlenberg, an American botanist. The spikelets of this genus are one-flowered, in contracted or rarely open panicles. Glumes mostly acute or bristle-pointed, persistent; the lower rather smaller or minute. Flowers very short stalked or sessile in the glumes; the paleæ usually hairy, bearded at the base, herbaceous, deciduous with the inclosed grain, often equal; the lower three-nerved, mucronate or awned at the apex. Stamens, three.

This genus is divided into two sub-genera, the first is

MUHLENBERGIA PROPER.—Its panicles are contracted or glomerate, terminal and axillary; perennials (in our species), with branching rigid culms from scaly creeping rootstocks; leaves short and narrow. It embraces the next six species. The second sub-genus is denominated TRICHOCHLOA, in which the panicle is very loose and open, the long branches and pedicels capillary; leaves narrow, often convolute bristle-form, and includes the seventh species.

1. *Muhlenbergia sobolifera.*—Spikelets, less than one line long, crowded on the branches. Glumes somewhat unequal, oblong,

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acute, barely pointed, about one-third shorter than the paleæ. Paleæ about equal, the lower one abruptly mucronate, conspicuously hairy at the base and roughish; culm ascending somewhat, branched, about two feet high. Leaves about two lines wide, pale green; sheaths open; ligule nearly wanting. Stigmas purplish. Flowers in August. Panicle with the flowers rather crowded on the slender branches which are appressed. Rhizoma creeping, woody, perennial. It is found in rocky woods. We have never met with it in meadows, and know nothing of its value.

2. *Muhlenbergia glomerata.*—Glumes linear, acuminate, nearly equal, terminating in a long rough straight bristle. Paleæ hairy on the lower part and at the base, each three-nerved, about half the length of the glume including the awn, acute, unequal, awnless; anthers yellow; culms upright, a little compressed, simple or with a few erect branches above. Leaves from three to five inches long, erect, rough, more or less glaucous. Ligule almost wanting; sheaths smooth and a little open. Panicle two to three inches long, oblong, *thyrsoid* (*i. e.*, having a dense contracted pyramidal panicle like the lilac, horse-chestnut and grape), interrupted at the base. Found in bogs and in dry sandy barrens. Flowers in August. We are unable to say anything of its agricultural value, as we have never tested it. It may be readily distinguished from *M. sobolifera*, by its awned glumes, and by their being longer than the paleæ.

3. *Muhlenbergia Mexicana.*—Spikelets about two lines long, pale green or dull purplish. Glumes unequal, linear-lanceolate, very acute, rough on the keel, the upper about the length of the lower palea. Paleæ awnless, very acute, hairy at the base; culm ascending and very much branched, from eighteen inches to three feet high, with numerous nodes and often geniculate. The panicles lateral and terminal often included at the base, elongated, with appressed branches, densely flowered. Flowers in August. Borders of fields; sometimes found in moist meadows, often in gardens from which it is very difficult to eradicate on account of its widely spreading perennial roots. We have seen cattle eat it in fields, but know very little about its value, though we suspect it is rather the best grass belonging to this genus. It may be distinguished from both the preceding species by its numerous branches and lateral spiked panicles. From *sobolifera* by its glumes which are unequal, those of *M. sobolifera* are equal. In this, the upper glume is equal to the lower palea; in the other, both paleæ are one-third longer than the glumes. From *M. glomerata* in which the glumes are awned, but in this, the glumes are awnless.

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The following measurements were made from an average specimen culm twenty-two and a half inches long. Panicle four and one-eighth. The leaves are from two to five inches long, and from one-eighth to one-fourth inch wide, the upper leaves are the longest. The flowering branches start from the sheaths at the axils of the leaves. The lowest axillary branch is fourteen inches long. The next eleven and one-fourth inches, the next (third) ten inches. The fourth, five and one-fourth inches. The three next panicles are partly included in the sheath.

4. *Muhlenbergia sylvatica.*—Glumes, which are shown in Fig. 43*d*, are almost equal, white, with a green keel, slender, acuminated, bristle-pointed, nearly as long as the lower paleæ. Paleæ, which are shown in Fig. 43*d* lifted out from the glumes, acute, often spotted with a purplish gray, with a slender rough awn at the tip twice or thrice the length of the spikelet (a magnified closed spikelet is shown in Fig. 43*c*); anthers, pale yellow; caryopsis, oblong, dark brown; culm ascending, much branched and diffusely spreading, two to four feet long, the branches at first erect, but at length diffuse; nodes swelling; leaves spreading broadly, linear; the sheaths open, smooth; ligule lacerate; panicles slender, many flowered, somewhat spiked; flowers in September. This resembles the preceding in its profuse branching, but may be distinguished from it by its awned paleæ; *M. Mexicana* is awnless. It grows on rocky hills and on the borders of woods. We have never met with it in meadows, and are ignorant of its properties for agricultural purposes.

5. *Muhlenbergia Willdenovii.*—Glumes ovate, acuminate, a little unequal, mucronate, with a prominent keel. Paleæ hairy at the base, unequal, entire, rough, the lower bears an awn from three to four times the length of the spikelet; culm upright from two to three feet long, sometimes having a few appressed branches, pubescent at the nodes; leaves two to four lines wide, very thin, spreading horizontally, the sheaths minutely pubescent; ligule nearly wanting; panicle elongated, slender, loosely flowered; branches filiform, often partly sheathed at the base. Rocky woods, rather common. It may be distinguished from the preceding species by the pubescence of its nodes and the greater length of its glumes. *M. sylvatica* being smooth on the nodes. It is distinguished from *M. Mexicana* by its awned paleæ. We are quite ignorant of its agricultural uses. Flowers in August.

6. *Muhlenbergia diffusa.*—Drop seed grass; in Kentucky it is called Nimble Will. Spikelets much smaller than the preceding; Fig.

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43*e*, a magnified spikelet, one line long, pedicillate; glumes are not one sixth as long as the paleæ, persistent, represented in Fig. 43*f*, somewhat enlarged; the lower one very minute, the upper truncate and unequally dentate. The paleæ, represented in Fig. 43*g*, are unequal, the lower one longer, almost triangular, with three prominent and scabrous nerves, terminating in a scabrous awn, once or twice the length of the palea, hairy at the base, the awn often purplish; anthers pale yellow; culm eight to eighteen inches long, diffuse and much branched, branches somewhat *assurgent* (*i*, *e.*, rising in a curve); culm somewhat geniculate and compressed. The panicles terminating the branches are slender, loosely flowered; they are both terminal and lateral; leaves flat, two to three lines wide, pale green, somewhat rough; sheaths open, smooth; ligule very short, truncate. Flowers, August, September. This grass is very abundant in the western States. Dr. Darlington observes that it is so little known in Pennsylvania that the farmers have never bestowed any name upon it, and the same may be said of New York and New England. In Kentucky, Tennessee, and in some parts of North Carolina, it forms a considerable proportion of some pastures where it is eaten by the cattle. It is chiefly found in dry hills and woods. Root fibrous, perennial.

7. *Muhlenbergia capillaris.*—Hair grass. Glumes unequal, one-third or one-half the length of the long-awned paleæ, the lower mostly pointless, the upper more or less bristle-pointed; culm simple, upright, two feet high from a fibrous perennial root; panicle capillary, expanding, six to twenty inches long, purple; pedicels one to two inches long, scarcely thicker than the awns, which are about one inch long. Found on sandy soils; west New England to New Jersey, Kentucky and southward. We have never seen this grass and are unable to speak of its qualities for want of knowledge.

11. BRACHYELYTRUM.—Name from the Greek *brachus*, short, and *electron*, husk, from the short glumes. The spikelets of the genus are one-flowered, half an inch long, excluding the awn. The two glumes very minute, the lower one scarcely perceptible. The lower palea has a long bristle on the summit, the upper one has a clavate pedicel or rudimentary flower at the base. Panicle simple, contracted. Perennial. Has but one species.

Brachyelytrum aristatum. — Glume represented in Fig. 43*h*, enlarged; the upper is minute, pointless, persistent, shorter than the width of the thick stalk of the flower. Paleæ represented in Fig. 43*i*, chartaceo-herbaceous, involute, inclosing the linear oblong grain,

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somewhat equal, rough, with scattered, short bristles; the lower five-nerved, contracted at the apex into a long straight awn about three quarters of an inch long; the upper two-pointed; the awn-like sterile pedicel partly lodged in the groove on its back; stamens two; anthers and stigmas very long; rhizoma creeping; culm simple, two to three feet high, pubescent about the nodes; leaves about six inches long, and from four to six lines wide, somewhat hairy, ciliate on the margin; sheaths loose, ligule oblong, lacerated; panicle racemose, erect. Flowers June, July. We have never met with this grass in cultivated grounds. It is oftenest found in rocky woods, especially on the sides of roads leading through such woods. No experiments have ever been made to test its value, we have never seen it cropped by the deer, even when close to their runways. For any thing we know, they may eat it before it comes into flower, but not afterward. Fig. 43*h*, represents a closed spikelet. Fig. 43*i*, an open spikelet, showing the pistils and stamens. Measurement of an average specimen; culm two feet four inches long; panicle four inches. It has five leaves, the first or upper one measures one and three-quarter inches; the second or next lower one, two and three-quarter inches; the third, three and a half inches; the fourth, three and one-quarter inches; the fifth, one and one-eighth inches.

12. CALAMAGROSTIS.—Reed bent grass. Blue joint. Name from the Greek *kalamos*, a reed, and *agrostis*, a genus of grasses. The spikelets of the genus calamagrostis are all one-flowered, and generally have the rudimentary pedicel of an abortive flower, in an open or spiked panicle. The glumes are keeled or boat-shaped, often acute, commonly nearly equal, and exceeding the flower, which is surrounded at the base by a copious tuft of white bristly hairs. Paleæ membranaceous, from Nos. 5 to 7 of a firmer texture; the lower bearing a slender awn on the back or below the tip, rarely awnless; the upper mostly shorter. Stamens three. Grain free. Perennials, with running rootstocks, and mostly tall and simple rigid culms. This genus is divided by Prof. Gray into three sub genera as follows:

1. CALAMAGROSTIS PROPER.—Flower, &c., much as in agrostis, except the hairy tuft, the boat-shaped glumes and the paleæ membranaceous; the former equal or the lower one rather longer; lower paleæ three to five-nerved, awned on the back; panicle open.

2. CALAMOVILFA.—Glumes and equal paleæ rather chartaceous, compressed, keeled; the lower glume shorter than the upper, and shorter than the paleæ, of which the lower is one-nerved and entirely

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awnless; the upper strongly two-keeled; rudiment wanting. Panicle open and loose. Includes Nos. 5 and 6.

3. AMMOPHILA.—Glumes nearly equal and rather longer than the equal similar paleæ, scarious, chartaceous, lanceolate, compressed, keeled; lower paleæ five-nerved, slightly mucronate, or obscurely awned near the tip; the upper two-keeled. Rudiment present and plumose above. Squamulæ lanceolate, much longer than the ovary. Panicle spiked, contracted. Spikelets large, half an inch long. Includes No. 7.

1. *Calamagrostis Canadensis.*—Blue joint grass. Canadian small reed grass. The spikelets are pedicellate, about one-eighth of an inch long. Glumes nearly equal, but the lower one perceptibly longest, lanceolate, acute, keeled, *serrulate* (*i. e.*, with *fine* teeth pointing forward, it is said to be *serrate* when the teeth are coarser), reddish purple on the sides. Paleæ unequal, the lower one with a blunt point, and somewhat two-toothed at the summit; it bears a very delicate awn below the middle of the keel, which is no longer than the hairs on the base, and which cannot be distinguished from them without looking closely; deciduous after flowering, when the glumes are open. Upper palea entire, obtuse. Hairs at the base of the paleæ, white, delicate, abundant, rarely exserted. Rudimentary pedicel minute, clavate, with long hairs at the summit. Stamens large and yellow. The glume is shown in Fig. 44, with the inclosed paleæ. The paleæ in Fig. 45, and the ovary and stigmas in Fig. 46. The whole plant is represented by Fig. 47. The panicle is oblong, at first erect, but afterward expanding. The length of the naked portion of the branches varies very much; in some it is half the length of the branch, in others somewhat less than one-third; the panicle is generally of a purplish-red color, the branches are from four to six in a whorl. The leaves are from twelve to eighteen inches long, rather glaucous and three to four lines wide, slightly pubescent on the upper side, but smooth on the lower; the upper leaf is longer than the panicle, and about the length of its sheath. The sheath is pretty close to the stem, and is surmounted by an oblong lacerate ligule. The culm grows from three to five feet high. It flowers in the latter part of July, and is found in wet grounds; it is very common in the interior of New York, but rare along the sea-board. It is frequently found in New England, and it extends well toward the south along the Alleghanies. It only flourishes in wet meadows. It constitutes about one-third of the natural grasses on the Beaver dam meadows of the Adirondacks.

We believe it has never been analysed, nor have its nutritive powers

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been subjected to any careful experiments. It is certain that cattle relish it very much both in its green state and when made into hay, and it is equally certain that the farmers who have it on their farms believe it to be one of the best grasses in their meadows. We only wish that this opinion was based upon some more tangible foundation. We know of no plants of any other genus that could be mistaken for this except perhaps the reed grass (*Phragmites communis*), which has much taller culms. The hairs are more woolly in their texture, and what settles the matter conclusively the spikelets are from three to seven-flowered. It may be distinguished from the next species by its glumes, which are *closed* in fruit, and are one-third longer than the hairs, and its awn, which is *stout* and inserted toward the base of the palea and exserted; whereas in *C. Canadensis* the glumes are *open* in fruit, no longer than the hairs, its awn *slender*, and not longer than the hairs. It is represented in Fig. 47. I give the measurement of a very tall specimen, which is much larger than the average: Culm, five feet eleven inches high; panicle, seven and three-quarter inches long. It consists of twelve whorls of branches. The lower whorl has seven branches. The middle one is the longest, and is three inches long. The two outer branches are each two inches. The intermediate branches are one and one-eighth inches long. The next whorl has seven branches. The three next have five branches. The next four have four branches each. The culm is furnished with seven leaves. The first, or highest, is eight and three-quarter inches long, with a ligule one-eighth inch long, which is generally lacerated. The second leaf, twelve and three-quarter inches. Third, twelve and three-quarter inches. The fourth leaf was broken off. The fifth was twelve inches long. The sixth was six and three-quarter inches. The seventh, or lowest, was withered and broken.

2. *Calamagrostis confinis.*—Spikelets similar to the preceding species, but rather larger. Glumes oblong, lanceolate, acute; about two and a half lines long; somewhat serrulate on the keel; roughish on the sides; acute, but not acuminate. Paleæ nearly equal, as long as the glumes, which are closed in fruit, acute, the lower one rough, three-nerved, notched at the tip, having a stout awn inserted between the middle and the base, which is slightly exserted. The glumes may be seen in Fig. 48, the paleæ in Fig. 49 and the rudimentary flower in Fig. 50. The panicle is from five to eight inches long, and is much more contracted than in the preceding species, the flower-bearing branches more closely compacted together, yet are distinct to the eye.

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The hairs are one-third longer than the flowers. The culm is about three feet high. Leaves two to three lines wide, with rough ligules. It flowers in July and August, and is found chiefly in swamps in northern and western New York, and in Pennsylvania. We are sorry to say that we know very little about its value in any respect. We have no experience in it ourselves, and we can find no record of any experiments that have been made to determine its value. A figure of it is given in Fig. 51.

3. *Calamagrostis coarctata.*—Glaucous, small reed grass. Glumes closed in fruit, lanceolate, narrow, carinate, acuminate, purplish, rough on the keel; the lower one without lateral nerves; upper one three-nerved, about three lines long. (Some have complained that they did not know the length of a *line.* For the benefit of such we say that a line is one-twelfth of an inch.) The paleæ are about one-fifth shorter than the glumes, lanceolate acute. The lower one is nearly twice the length of the hairs, and is five-nerved. It is split at the summit, and bears a stout straight, exserted awn, arising from the back about one-third of the way down. The rudiment is stout, with a thick tuft of hairs at the summit. Fig. 52 is the glume, inclosing the flower, Fig. 53 the paleæ, Fig. 54 the rudimentary flower, all magnified. The panicle is from three to six inches long, the spikelets more crowded on the branches than in *C. confinis;* the branches appressed, and pale after flowering, elongated; branches short, from three to five in a fascicle; culm three to five feet high, somewhat glaucous; leaves three to five lines wide, rough; ligule oblong, obtuse; grain hairy and crowned with a bearded tuft. Flowers in August, and is generally found in wet meadows, in swamps, and along the banks of rivers. It is often affected with ergot. This species may be distinguished from *C. confinis* by its thicker panicle, its more acute glumes, its shorter hairs, and by its awn, which is fixed higher on the back of the pales. We must make the same mortifying confession that we were obliged to make with respect to the preceding species, that we know little or nothing of its properties, or what changes might be produced in it by cultivation. Fig. 55 represents the grass as a whole.

4. *Calamagrostis Pickeringii.*—Glumes ovate, acute. Paleæ nearly equal, rather shorter than the glumes. The awn is inserted between the middle and the base, stout, often a little bent, not exceeding the glumes; hairs very short and scanty, one-fifth of the length of the paleæ, half as long as the small plumose rudiment; culm one foot high; leaves short and flat. Flowers in September; is found in the

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Alpine region of the White mountains, New Hampshire. We have never seen this grass. The description is from Professor Gray.

5. *Calamagrostis brevipilis.*—Glumes ovate, mucronate, the upper slightly, the lower nearly one-half shorter than the paleæ; paleæ about twice the length of the hairs, and are bristly bearded along the keels; panicle diffusely pyramidal, the branches capillary, purplish; culms slender, three to four feet high; leaves nearly flat. Flowers in September, and is found in the sandy swamps and pine barrens of New Jersey.

6. *Calamagrostis longifolia.*—Glumes lanceolate, the upper as long as the similar paleæ, the lower a quarter shorter; the copious hairs are more than half the length of the naked paleæ; spikelets, one-fifth of an inch long; culm one to four feet high, stout, from thick running rootstocks; leaves rigid, elongated, involute above and tapering into a long thread-like point; sheaths clothed with deciduous wool; branches of the pyramidal panicle, smooth. It is found on the sandy coast of northern Michigan, and north-westward.

7. *Calamagrostis arenaria.*—Sea sand reed. Beach grass. Mat grass. Spikelets much compressed, and are about half an inch long, narrow and consist of one floret (Fig. 56, natural size). Glumes (Fig. 57, magnified) nearly equal and rather longer than the paleæ, scarious-chartaceous, linear lanceolate, rough on the thin keel; the lower one has a single nerve, the upper three-nerved. Paleæ (Fig. 58, magnified) resemble the glumes; the lower one slightly mucronate a little below the tip, obscurely five-nerved, the upper two-keeled; the hairs about one-third of the length of the paleæ; the scales linear, lanceolate, somewhat longer than the ovary; anthers linear, yellow; styles short, plumose; panicle six to ten inches long, of a very light almost white color, very close and spike-like; culm two to three feet high, erect, rigid; leaves long, smooth and glaucous, drawn out to a long, slender point, and soon become involute; sheaths smooth; ligule obtuse, oblong. Flowers in August. Rhizome branching and creeping. It is found on sandy beaches, from New Jersey to Maine, and on Lakes Michigan and Superior. It is very abundant, on the sandy sea coast of Long Island and Staten Island.

We have been familiar with this grass from childhood, yet we have never seen it cropped by any kind of animal; goats, usually so rapacious, and so ready to devour every green thing, never touch the beach grass. Rabbits, that eat everything else, give this grass a wide berth and cannot be driven to take a mouthful of it by the strongest stress of hunger. Animals do not need to try the experiment in order

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to know whether they like it or not, there is a certain something in its aspect which is ever sounding *noli me tangere*, in trumpet tones, and warning every animal to avoid it. Its pale, sickly looking spike, armed with long, sharp, prickly glumes, looks more like some savage military weapon, than a wholesome vegetation. Unlike all its congeners, its culm is solid; its numerous rigid, involute and sharp pointed leaves stand up like armed sentinels to keep off the invader. It would, indeed, be a silly beast that would attack such a fortress. And yet, notwithstanding its uselessness as an agricultural grass, it must have some useful purpose. God does not make mistakes, and he has diffused it over a wider area of the earth's surface than any other grass. It is found in Sweden, Norway, and Lapland, considerably inside the Arctic circle, while its southern border extends to the extreme southern limit of our own country and although no animal eats it, it is nevertheless rich in nutritive matters. The experiments at Woburn showed that it produced, from a silicious soil, at the time of flowering, 10,890 pounds of grass to the acre, which lost about half its weight in drying, and yielded fully 680 pounds of nutritive extract, a large proportion of which was saccharine matter. This shows 226 pounds more of nutritive matter to the acre than is afforded by *Alopecurus pratensis*, which is justly considered one of our best grasses, and forms another excellent illustration of a fact to which we have often directed the attention of our readers, that chemical analysis, valuable as it is, is not a sufficient guide to the practical feeding of animals until it is supplemented by actual trial at the manger.

Beach grass is the most advanced sentinel of the vegetable kingdom on those sandy coasts which form the barrier of the sea, and is found at all altitudes lower than 1,000 feet. Its use in restraining the ravages of the ocean on sandy shores, has been recognized from time immemorial, and its destruction in those situations has been for a long period punished by law. In Great Britain it is known as Sand Bent, Marrum and Star grass. In the reign of William III, the Scottish Parliament passed an act for its preservation. An act was passed by the English Parliament in the reign of George II, still more stringent in its provisions. It prohibited, under the severest penalties, any person, the lord of the manor not excepted, to cut or pull "sand bent," or to be found having it in possession within eight miles of the coast; nor has this law become obsolete at the present day, as Mr. Gorrie (in Morton's Enc. Ag.) tells us that so recently as 1847, a man was fined ten pounds, Scots, and a guinea and a half

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sterling of expenses for pulling the bent grass on sand hills. These provisions are fully vindicated by the magnitude of the evil to be avoided, and the admirable adaptation of the beach grass for its cure. It is well known to the dwellers by the seaside that the fierce and howling winds from the ocean carry tons of dry sand from the shore into the interior, which form drifting, useless sand ridges upon fertile fields, and sometimes even bury houses in their path; at other times the sea rushes in like a new deluge and destroys miles of the coast by its violence. The beach grass effectually resists both of these destructive tendencies. Its long, creeping roots, extending sometimes to the extent of forty feet, and bearing tubers the size of a pea, interlace with a death-like tenacity of grasp, and form a net work beneath the sand which resists the most vehement assaults of the ocean waves, while the tough culms bend to, but do not break with the roughest blasts from the ocean. The sand may cover them, but in a few days their tops rise above the surface, and in a few weeks they rise as high as ever above it. Sand cannot smother it; and in this way, alternately covered by it, and growing above it, a wall of sand is gradually raised, which effectually prevents the incursions of the ocean and the excursions of sand into the interior of the country. Mr. Gorrie says many fertile fields have been made barren, and many thriving hamlets and villas have been deserted in consequence of the destruction of the sea-bent, by the former inhabitants, who used it for thatching their houses, for sweeping-brooms, door mats, fuel, &c. He says, also, that the displacement of "benty banks and links," by marine villas and other modern improvements, is also, in many parts, attended with the most baneful effects on the adjoining coast lands, a great instance of which exists on the Mid Lothian shores of the Frith of Forth, on part of which the sand barriers disappeared where their vegetation became displaced by the town sewer irrigated meadows, and where in other parts they have been superseded by extensive harbor works, and their necessary accompaniments of sea-skirting roads and railways; the consequent results being progressive inroads, by the sea, on valuable lands, and its repeated destruction of costly bulwarks; showing the futility of the best engineering skill, when substituted for the means by which Creative Wisdom determined the bounds beyond which the proud waves should not pass. The seeds of this grass weigh about fifteen pounds to the bushel, and have the appearance of light oats. The beach birds feed and fatten on them. It is very difficult, on account of the shifting sands, to propagate it from the seeds, especially in the

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spring, when high winds are so apt to prevail. The most usual way of effecting this, in Europe, is to deposit turf at regular and short intervals over the surface, and then sowing the seeds over the interspaces by mixing them with clay attached to small pieces of straw rope, and dibbling these into the sand. It is usual there to sow both the seeds of *C. arenaria* and *Elymus arenarius* together; and eight or ten pounds of each is thought quite sufficient. To prevent the encroachment of the shifting sands, the most effectual means is to sow the seeds of the above grasses over a breadth of twenty to fifty yards, and, in some instances, over even 100 yards, immediately *in advance* of such sands. In damp weather the seeds sometimes assume the most grotesque forms, and are very full of ergot. Mr. Flint, in his valuable work on grasses, tells us that the usual way of propagating the beach grass, in Massachusetts is by transplantation. The grass is pulled up by hand and placed in a hole about a foot deep, and the sand pressed around it by the foot. These holes are dug about one foot and a half apart. The spring is the usual time of planting, though many do this work in the fall and winter. The roots thus planted send up fresh culms, and the ground is soon sufficiently covered. Mr. Flint says that the town of Provincetown, once called Cape Cod, where the pilgrims first landed, and its harbor, still called the harbor of Cape Cod, one of the largest and most important in the United States, sufficient in depth for ships of the largest size, and in extent to anchor 3,000 vessels at once—owe their preservation to this grass. To an inhabitant of an inland country it is difficult to conceive the extent and the violence with which the sands, at the extremity of Cape Cod, are thrown up from the depths of the sea, and left on the beach in thousands of tons by every driving storm. These sand hills, when dried by the sun, are hurled by the winds into the harbor and upon the town. One of Mr. Flint's correspondents writes from Provincetown: "Beach grass is said to have been cultivated here as early as 1812. Before that time, when the sand drifted down upon the dwelling-houses, as it did every time the beach was broken, to save them from burial the only resort was to wheel it off in barrows. Thus tons were removed every year from places that are now perfectly secure from the drifting sands. Indeed, were it not for the window glass in some of the oldest houses in these localities, you would be ready to deny the statement; but the sand has been blown with such force, and so long, against this glass as to make it *perfectly ground*. I know of some windows through which you cannot see an object, except to remind you of the passage where men were seen 'as trees

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walking.' It may be proper to state that this town does much in the way of '*beach grassing*' by its '*beach grass committee*,' whose duty it is to enter any man's inclosure, summer or winter, and set out grass, if the sand is uncovered and movable. By this means we are now rid of sand storms, which were once the terror of the place, being something like snow storms, for drifts which were to be removed. Our streets are now hardened with clay which has been imported; and instead of its being buried, as it once would have been, in a few days, I notice that the surveyors have to resort to sprinkling it with sand in wet weather, so effectually has the culture of beach grass answered the end." A farmer of much practical experience says: "Since the cattle have been kept from the beaches, by the act of the Legislature of 1826, the grass and shrubs have sprung up of their own accord, and have, in a great measure, in the westerly part of the Cape, accomplished what was intended to be done by planting grass. It is of no use to plant grass on the high parts of the beach. Plant on the lowest parts and they will rise, while the highest places, over which the grass will spread, are leveling by the wind. To preserve the beach it must be kept as level as possible." In addition to the inestimable value of beach grass for the purposes above stated, it is used for thatching the roofs of buildings, for which it is greatly superior to straw; mats and brooms are also made from it; it is employed for making bee-hives, rustic straw hats, and many other useful as well as decorative purposes. A very useful fibre, resembling flax, is also obtained from it, and has often been used for making a strong, tough paper. When dried in the sun its hard, elastic foliage is bleached and may be made into very handsome ornamental articles, such as mats, fancy baskets, match boxes, etc, elegantly constructed examples of which were exhibited in the great Hyde Park exhibition of 1851.

13. ORYZOPSIS.—Mountain rice. From *oryza* rice, and *opsis*, resemblance. The spikelets of this genus are one-flowered, nearly *terete* (*i. e.*, round like a column, cylindrical or tapering, applied to stems). Glumes herbaceous membranaceous, several nerved, nearly equal, commonly rather larger than the oblong flower, which is deciduous at maturity, and with a very short obtuse callus or scar-like base. Lower palea coriaceous, and at length involute, so as closely to enclose the upper (of the same length) and the oblong grain; a simple, untwisted and deciduous awn, jointed on its apex. Stamens, three. Squamulæ, two or three, conspicuous. (See Fig. 58*c*, where they may be seen standing by the pistils, nearly as long as the paleæ.) Styles sometimes united. Stigmas plumose. Perennials, with rigid

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leaves and a narrow raceme or panicle. Spikelets greenish, rather large. It includes three species.

1. *Oryzopsis melanocarpa.* Black-fruited mountain rice. Spikelets, a quarter of an inch long, five or six racemes on the lower branches, two or three on the upper ones, stand on elavate pedicles. Glumes ovate, lanceolate, acuminate; the lower one seven-nerved, the upper five-nerved, their margins scarious, nearly equal. Paleæ acuminate, shorter than the glumes, blackish when mature, somewhat hairy at the base; the lower embraces the upper one in fruit, and is furnished with a straight awn at the tip, thrice the length of the palea. Styles distinct, short. Culm two to three feet long, leafy to the summit. Leaves eight to twelve inches long and nearly half an inch wide, flat and taper pointed, dark green, pubescent underneath smooth above, sheaths with a bearded ring at the throat. Panicles sparingly branched; the lower branches often in pairs having their spikelets racemed and divergent. Flowers in August, caryopsis black. Found in rocky woods. We have never seen this in meadows. When in rocky pastures it is cropped and eaten with apparent relish by cattle. We are not aware that it has ever been cultivated.

2. *Oryzopsis asperifolia.*—Large, white-grained, mountain rice. Glumes like preceding (see Fig. 58*b*). Paleæ (see Fig. 58*c*), whitish when mature, with a short dense tuft of white hairs at the base, the lower one involute and surrounding the upper, thinly clothed with appressed hairs, the slender curved awn about twice the length of the palea; (see Fig. 58*b*). The upper palea shorter and narrower. Squamulæ lanceolate linear, almost as long as the paleæ. See Fig. 58*c*, where they reach nearly to the middle of the pistil. Panicle two to three inches long, very simple, the branches short and mostly appressed, racemosed. Culms ten to eighteen inches high, smooth, radical leaves elongated, about as long as the culm, acuminate, glaucous, underneath rough, culm leaves few, from two to three, very short, the upper sheaths almost naked and a little swelling, and generally last through the winter. Flowers in May, and is found on hill sides, in rich woods. We think this is eaten by cattle with more relish than the preceding species. It may be distinguished from it by its *white* paleæ, its shorter culms, and longer root leaves, and by its *united* styles.

3. *Oryzopsis Canadensis.*—Small mountain rice. Spikelets about two lines long. Glumes ovate, membranaceous, convex concave, obtuse or abruptly acuminate, obscurely nerved. Paleæ as long as the glumes, equal, acute, nerveless, densely clothed with short, white,

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appressed hairs, lower one often with a short awn at the tip, which is very deciduous or wanting. Styles united, stigmas white. Culm six to fifteen inches long, slender but rigid. Radical leaves six to eight inches long, about a line wide, erect, strongly nerved, and rough above, smooth underneath, finally involute, thread-shaped; culm leaves varying from an inch to scarcely a line in length, sheaths a little swelling, roughish, the ligule ovate, lacerate and bearded. Panicles contracted, the branches usually in pairs, ovoid, about two inches long, consisting of few spikelets, the branches flexuous, bearing one or two spikelets at the extremity. Flowers in May. Grows from western New England to Wisconsin and northward, on rocky hills and dry barren plains. It is found on the Crow's Nest on the Highlands of the Hudson. We know absolutely nothing of its agricultural value. It may be readily distinguished from both the preceding species by its smaller stature and its very minute culm leaves.

14. STIPA.—Feather grass. From the Greek, *stupe*, a feathery material, some of the species having feathered awns. The spikelets of this genus are one-flowered, terete, the flowers falling away at maturity, with the conspicuous obconical, bearded, and often sharp pointed stalk (callus) from the membranaceous glumes. Lower palea coriaceous, cylindrical, involute, closely embracing the smaller upper one and the cylindrical grain, having a long and twisted or tortuous simple awn, jointed with its apex (naked in our species); stamens mostly three; stigma plumose. Perennials, with narrow involute leaves and a loose panicle. It includes three species.

1. *Stipa Richardsonii.*—Glumes nearly equal, pointless, oblong, acutish, two and a half lines long, about equaling the pubescent, linear, oblong, lower palea, which bears a tortuous or geniculate awn six to eight lines long; callus or base of the flower short and blunt; culm one and a half to two feet high and leaves slender; panicle loose, four to five inches, with slender, few-flowered branches. Grows at Pleasant mountain, near Sebago lake, Maine, and north-westward. We know nothing of this grass, or of No. 3, never having seen either of them, the descriptions of both are copied from Professor Gray.

2. *Stipa avenacea.*—Black oat grass. Glumes nearly equal, acuminate, about as long as the paleæ, about four lines long; paleæ blackish, the awn two to three inches long, is bent above and twisted below; the lower palea is slender and minutely bearded at the tip, rough; the upper palea smaller, membranaceous, mucronate; *stipe* (*i. e.*, a little footstalk of seeds, flowers, etc.) thickly clothed with brown hairs; scales two, lanceolate; culm one to two feet high,

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slender; leaves mostly radical, setaceous, six to eight inches long panicle somewhat secund and spreading, the branches mostly in pairs, somewhat nodding, at first contracted, but finally diffused. Flowers late in June. Is used to ornament vases, but not of any agricultural value that we know of.

3. *Stipa spartea.*—Porcupine grass. Glumes lanceolate, slender, sublate, pointed, greenish; paleæ linear, about one inch long (including the pungently-pointed callus which is villous-bearded at maturity), pubescent below, shorter than the glumes; the lower palea slender and minutely bearded at the tip; it has a strong twisted awn three and a half to seven inches long; panicle contracted; culm rather stout, one and a half to three feet high. It is found on plains and prairies from Illinois and northern Michigan north-westward.

4. *Stipa pennata.*—This grass, although not a native of America, is so beautiful in itself, and so frequently cultivated as an ornament in gardens, that we think our readers will like to have a description of it, although it is never, as far as we know, found in our meadows or pastures. The description is from Parnell on grasses. Spikelets large, few, composed of two glumes and one floret; glumes of nearly equal length (see Fig. 59, magnified view), long, slender, furnished with a few long scattered hairs, especially on the keels; paleæ (see Fig 60, magnified view), about half the length of the glumes, the outer palea, five ribbed, hairy and pointed at the base, terminating in a long feathery awn (see Fig. 60, magnified awn). The inner palea rather shorter than the outer, membranes acute. The awn arises from the very summit of the outer palea, and is often more than twenty times its length, soft and feathery the whole length, except at the base where it is twisted for about the space of an inch. The inflorescence is racemed, bursting from the upper sheath; stem erect, round, smooth, hollow, usually about two feet high, bearing four or five leaves with roughish sheaths, the upper sheath longer than its leaf; ligule of the upper sheath hairy, long and pointed, about twice as long as broad, joints three or four, all covered by the sheaths; leaves long, slender, rigid, setaceous, frequently hairy upon both sides. Flowers early in August. It grows wild in many places in Germany, in dry sandy situations; it is also said to grow in the county of Westmoreland, in England. Fig. 59 is the glume; Fig. 60 the palea and awn; Fig. 61 the ovary and style; and Fig. 62 represents the whole plant.

15 ARISTIDA.—Triple-awned grass; name from *arista*, the Latin word for beard. The glumes are unequal, often bristle-pointed; lower palea tipped with three awns; the upper palea much smaller; other-

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wise this genus is much like *stipa;* the culms are branching; leaves narrow, often involute; spikelets in simple panicled racemes or spikes. This genus includes seven species.

1. *Aristida dichotoma.*—Poverty grass. Spikelets small, mostly crowded and panicled. Glumes one-nerved, from a quarter to half an inch in length, longer than the flower, linear, serrulate on the keel; mucronate or slightly awned a little below the tip. Paleæ very unequal; lower one closely involute, smoothish; the lateral divisions of the awn not half the length of the paleæ; the middle awn contorted or bent horizontally, which is about as long as the palea. Panicle contracted, racemose. Culms erect or ascending; *cespitose* (*i. e.*, several stems growing from the same root, forming a tuft or tussock); *dichotomously* (*i. e.*, two-forked) branched from the base, four to fifteen inches in height, slender, branching at each joint; leaves very slender, erect, smoothish; the sheaths shut and open; root annual. Flowers in September. Very common in sandy fields and dry, sterile hillsides. This grass is represented by Fig. 63. Fig. 64, a magnified branch of the same. It is supposed to be among the poorest of the grasses; but nothing is really known about it.

2. *Aristida ramosissima.*—Glumes two-thirds to three-quarters of an inch long, about equaling the flower, three to five-nerved, short awned; the inner one two-cleft at the tip; the awn on the middle of the palea about an inch long, soon recurved; the lateral ones only about one-fifth the length of it; ligule truncate, bearded. We have never met with this grass, but give the description from Prof. Gray. It is found on the dry prairies of Illinois and Kentucky. Culms diffuse, spiked; raceme simple and loosely flowered.

3. *Aristida gracilis.*—Glumes as long as the paleæ, a little unequal, somewhat awned, rough on the keel; lower palea rough, and the keel conspicuously serrulate; *spinulose* (*i. e.*, covered with small spines), a little hairy at the base, often spotted or banded with dull purple or gray; lateral awns mostly rather shorter than the paleæ; middle one more than twice as long as the others, bent, not twisted; panicle two to five inches long, slender; the branchlets few-flowered and rather remote; culm erect, slender, four to fifteen inches in length, smooth; leaves very narrow, convolute when dry; the sheaths with a few long hairs at the throat. Sandy fields, Suffolk county, Long Island; it extends from Massachusetts to Illinois, and southward. Flowers in September. Its presence is always a sign of great poverty of the land.

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4. *Aristida stricta.*— Lower palea smooth, three or four lines long; awns equally spreading divergently, half an inch long; the lateral somewhat shorter than the central; culms simple; one to two feet high, terminated by a long and strict virgate many-flowered spiked panicle; leaves involute-filiform, rigid, downy or glabrous. Grows in Virginia and southward.

5. *Aristida purpurascens.*—Glumes purple colored; about three-eighths of an inch long, slender, bristle pointed, keeled; somewhat unequal; the lower longest, serrulate. Paleæ chartaceous, four to five lines in length; the outer involute, minutely serrulate, hispid on the keel and the slender lateral nerves, bearing three diverging awns upon its tip, the central one about one inch long, the others about three-sixteenths of an inch shorter; the awns are rough, serrulate. Panicle racemose, the branches appressed; capillary from an eighth to a quarter of an inch long; panicle eight to twelve inches long. Leaves smooth, involute-filiform; the root leaves eight to twelve inches long; leaves of the culm four to six inches long. Ligule inconspicuous. Culm twelve to twenty inches high, slender; root fibrous, perennial. Massachusetts to Michigan, Illinois and southward. We have stated that the nerves of the palea were hispid, on the authority of Dr. Gray, but they were not so on any of the specimens before us. This grass is reputed to be useless. Like many of the others, little is really known about it. The agricultural ant of Texas (*Myrmica molefaciens*), allows no grass to grow in the cities which they build, except *Aristida stricta*, the grain of which they harvest when ripe, carefully remove the chaff from it, and store it away in carefully prepared dry cells for future use. Lincecum avers that the ants even sow this grain.*

6. *Aristida oligantha.* — Spikelet slarge; very short pediceled; glumes equalling the flower, eight to ten lines long; the lower, three to five-nerved and two-cleft at the tip; the upper, one-nerved and more awned at the tip; awns of the paleæ one and one-half to three inches long, *divaricate* (*i. e.* straddling very widely divergent); the lateral a little shorter than the middle one. Culms branching below, one foot to eighteen inches high; the branches naked above, and racemosely or paniculately several (four to twelve) flowered. It is found from Virginia to Illinois and south-westward, and resembles small forms of the following. We have never met with this grass, and therefore know nothing about its valne; the description is copied from Prof. Gray:

* Guide to the Study of Insects, page 185.

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7. *Aristida tuberculosa.*—Glumes one inch long, including their slender awned tips, longer than the paleæ; lower palea tipped with the common stalk, which is about its own length, of the three equal divergently bent awns which are one and a half to two inches long, twisting together at the base; sandy soil. East Massachusetts to New Jersey, also Wisconsin, Illinois and southward. Culm branched below, six to eighteen inches high, turned at the joints; panicles rigid, loose; the branches in pairs; one of them short and about two-flowered, the other elongated and several-flowered.

16. SPARTINA—Cord or Marsh grass. Name from the Greek *spartine*, a cord such as was made from the bark of the *spartium*, or broom. The spikelets of this genus are one-flowered, without a rudiment; very much flattened laterally; spiked in two ranks on the outer side of a triangular rachis. Glumes strongly compressed keeled; acute or bristle pointed; mostly rough bristly on the keel; the upper one much larger and exceeding the pointless and awnless paleæ, of which the upper is longest. Squamulæ none. Stamens, three; styles, long; more or less united. Perennials with simple and reed-like culms, from extensively creeping scaly root-stocks; racemed spikes, very smooth sheaths, and long and tough leaved. This interesting genus, embracing four species, forms the basis of the salt marsh meadows which are so much valued in New England, Long Island, and along the sea coast southward.

1. *Spartina cynosuroides.*—Fresh water Cord grass. Spikelets imbricated on two sides of a depressed triangular rachis. Glumes awn-pointed, linear lanceolate; the upper, five to seven lines in length, strongly spinulose on the very prominent keel which is green while the rest is yellowish, twice the length of the lower one and sometimes more, tapers to a rough subulate awn point. The lower linear, rough keeled, sometimes as long as the palea, but oftener somewhat shorter, awn-pointed. Lower palea spinulose on the keel, upper scarious, a little longer than the lower, a little rough toward the summit of the keel. Spikes five to eighteen, from one and one-half to three inches long. The scabrous peduncles, three to five lines long, spread at maturity; the spikes are scattered, forming a long secund panicle. The culm is rather slender, from two to five feet high; rachis rough on the margins. Leaves narrow, two to four feet long, and half an inch wide below; at first flat, but in dry weather became quickly involute; sheaths smooth; ligule bearded; anthers large, yellow; styles connate, except near the summit. It is found mostly on the banks of rivers and lakes. Flowers in August. It is found

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nearly everywhere in New York, but is most abundant northward. Fig. 65 shows a magnified spikelet. Fig. 66, the lower palea, showing the slightly two-cleft summit. Fig. 67, the flower with the glumes and paleæ removed. Fig. 68, the entire grass.

2. *Spartina polystachya.*—Salt reed grass. Glumes barely mucronate; the lower half the length of the equal paleæ, of which the rough hispid midrib of the lower one reaches to the apex. Spikes ten to forty, forming a dense oblong purplish raceme. Culm tall and stout, four to nine feet high, and often one inch in diameter at the base. The leaves are from two to four feet long and from half an inch to one inch wide; roughish underneath and on the margins. The spikes are purple in color. Flowers in August. When this and the preceding species are well marked, there is no difficulty in discriminating between them; but there are intermediate kinds of which we have found it very difficult to say whether they belonged to one, or to the other species. We generally distingnish them at a glance, by the size, No. 2 being twice as large as No. 1; again, the flowers of No. 1 are of a pale, greenish yellow color, and those of No. 2 are purple. The awns of the glumes are long and rough in No. 1, but merely mucronate in No. 2. But it sometimes happens that No. 1 is unusually tall and No. 2 unusually short; sometimes the spikes of No. 1 are tinged with purple, and the awns are much shorter than common; while the ordinary little *mucro* of No. 2 becomes hypertrophied into something very like the awn of No. 1. In these exceptional cases it requires a better botanist than we pretend to be to assign the specimen to No. 1 or No. 2. This species is found in salt or brackish marshes, within tide water; it is abundant on the shores of Long Island Sound and on the southern shore of Long Island and southward.

3. *Spartina juncea.*—Rush salt grass. Spikelets purple, somewhat spirally twisted on the triangular rachis, sessile, closely imbricated, five-sixteenths of an inch long. Glumes chartaceous; lower one serrulate on the keel, lanceolate linear, sharp pointed but not awned; the upper one smooth, scarious, linear, a little over one-third of the length of the lower one. Paleæ a little reddish and rough at the upper part of the keel, lanceolate but rather obtuse; upper one smooth, about twice the length of the upper glume. Styles elongated, distinct except near the base. Culm one to two feet high, erect, rigid, smooth. Spikes one to five, mostly three, the lowest with distinct peduncles. Leaves six to ten inches long, smooth, slender, narrow and rush like, strongly involute. Sheaths

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close, surmounted by a very short lacerate ligule. Flowers in August, and is very common on salt marshes and sandy sea beaches. It may be distinguished from both the preceding by its awnless glumes and the obtuse rounded tips of the paleæ, and by the want of a woolly beard at the ligule. It forms a considerable portion of the salt meadow hay of the coast.

4. *Spartina stricta.*—Salt marsh grass. Spikelets loosely imbricated, laterally compressed. Glumes hairy, the keel spinulose, the upper one from one-half to one-third longer than the lower one, one-nerved. Paleæ unequal; the outer palea the shorter, hairy and without lateral nerves; the inner palea longer than the glumes, with two delicate nerves. Spikes from two to four in number, sessile, erect, soft, yellowish. Rachis angular, projecting slightly beyond the imbrication of the spikelets. Culm ten to thirty inches in length, leafy to the top. Leaves convolute, narrow, easily separated from the sheaths. Ligule very short, obtuse, ragged; the upper leaf shorter than its sheath. Root perennial, with strong, creeping fibres. Fig. 69, enlarged spikelet showing the glumes; Fig. 70, paleæ and included floral organs lifted out of the glumes; Fig. 71, the entire plant; Fig. 71*a* shows the leaf and ligule, natural size. Salt marshes Pennsylvania, &c. There is a variety of this species, which, by some authors, is put as a separate species, known as *alterniflora*. It has a greater number of spikes, from five to fourteen; they are more slender, from three to five inches long; the rachis is produced considerably beyond the spikelets, having an awn-like appearance; the glumes indistinctly five-nerved. Its odor is rancid and disagreeable. Cattle are very fond of it, eating it greedily; but it is said that the odor is imbibed by the milk, and even the flesh of the animal; though this needs confirmation. It flowers in August and September. It is found in muddy places and the borders of salt marshes; generally in places that are overflowed by the tide. It is used a good deal for thatching, for which purpose it is superior to wheat straw, and lasts much longer. Fig. 72 shows the floret of *Var. alterniflora* and the glumes; Fig. 73, the paleæ; Fig. 74, the ligule; Fig. 75, the entire plant.

17. CTENIUM.—Toothache grass. Name from the Greek *Ktenion*, a small comb, from the pectinate appearance of the spike. Spikelets densely imbricated in two rows on one side of a flat *arctuate* curved (*i. e.*, bent in the shape of a bow) rachis, forming a solitary terminal spike. Glumes persistent; the lower one (interior) much smaller; the other concave below, bearing a stout, recurved awn, like a horn on the

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middle of the back. Flowers four to six, all but one neutral; the one or two lower consisting of empty awned paleæ; the one or two uppermost of empty awnless paleæ; the perfect flower intermediate in position, its paleæ membranaceous, the lower awned or mucronate below the apex, and densely ciliate toward the base, three-nerved. Squamulæ two. Stamens three. Stigmas plumose. In describing this genus, we, or rather Prof. Gray from whom we borrow it, have introduced the terms neutral flowers and perfect flowers; we must now describe exactly what we mean by these terms. No flower can produce seeds that is not furnished with two separate and distinct organs, viz.: The stamens and the pistils; the former produces the pollen or vivifying agent; the later receives it and works those transformations in it which are essential to the perfection of the seed. By analogy, we call the stamens the *male* organs, and the pistils the *female* organs; the two together constitute the *sexual* system of the flowers. When these organs are wanting, the flower is said to be *neutral*, as it is of no sex and therefore infertile. When a flower has both stamens and pistils in one floral envelope, it is said to be *perfect* or *fertile*. When *one* of the sexual organs is absent in a flower, whether it be stamen or pistil, it is said to be *imperfect*. Fig. 75*a* represents a spike of *C. Americanum*, of natural size; Fig. 75*b* a spikelet enlarged; Fig. 75*c*, the flower raised out of the glumes.

Ctenium Americanum.—Large glume, warty-glandular outside and conspicuously awned. Culm three to four feet high, simple, pubescent or roughish. Taste very pungent. Wet pine barrens, south Virginia and southward.

18. Bouteloua.—Muskit grass. Named for Claudius Boutelou, a Spanish writer upon floriculture and agriculture. Spikelets crowded and closely sessile, in two rows on one side of a flattened rachis, comprising one perfect flower below and one or more sterile (mostly neutral) or rudimentary flowers. Glumes concave keeled, the lower one shorter. Perfect flower with the three-nerved lower palea three-toothed or cleft at the apex; the two-nerved upper palea two-toothed; the teeth, at least of the former, pointed or subulate-awned. Spikes solitary, racemed or spiked; the rachis somewhat extended beyond the spikelets. This genus includes three species and one sub-variety.

1. *Bouteloua oligostachya.*—Glumes sparingly soft-hairy, obscurely papillose along the keel. Lower palea sparingly hairy, the lobes awl-pointed, middle lobe two-cleft at the tip. The sterile flowers, about two in number, are mounted on the summit of a short pedicel, generally an awnless scale, becoming hood-like and coriaceous. The

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sterile flower is copiously villous tufted. The spikes are *pectinate* (*i. e.*, separated into narrow divisions resembling the teeth of a comb) and consist of a great many spikelets, oblong or linear, very dense, solitary and terminal, or few in a raceme, and are from one to five in number. Culms from six to twelve inches high. Leaves very narrow. Rachis glabrous. Found in western Wisconsin and westward.

2. *Bouteloua hirsuta.*—Lower glume hispid with strong bristles, from dark, warty glands, bristles half as long as the glumes. Lower palea pubescent, three-cleft into awl-pointed lobes. The sterile flower and its pedicel glabrous, the three awns longer than the glumes and the fertile flower. Spikes one to four. Culms tufted from an annual root, from eight to twenty inches high. Leaves flat, lance linear; papillose, hairy or glabrous, very short, edges rough, sheath bearded at the top. It is found on sandy plains in Wisconsin, Illinois and south-westward.

3. *Bouteloua curtipendula.* Darlington, Torrey and others call it *B. racemosa.* Spikelets two, rarely three-flowered. Lower glumes very narrow. The upper one hispid on the keel, lanceolate. The perfect flower sessile, lanceolate. The lower palea with three nearly equal awl-pointed teeth; scabrous. The upper one is a little longer; has two keels, and is bifid at the apex. Stamens bright, cinnabar red color. Abortive flower pedicillate and neuter; it has one or two minute scales, and from one to three awns shorter than the fertile flower, the central awn being the longest. The spikes are short, about one-third of an inch long, twenty to fifty in number, in a long and *virgate* (*i. e.*, wand-like, long, slender and straight) one-sided spike or raceme, rather distant, spreading or reflexed, each of four to twelve spikelets. They are arrayed on two sides of a common rachis, becoming at length secund. The common spike is from eight to fifteen inches long. The culm is tufted, perennial, two to three feet high, geniculate at the base, smooth. Leaves two to three lines wide, tapering to a long slender point, involute when dry, rough on the margin, somewhat hairy on the upper side. Sheath rather loose, the lowest ones often hairy. Ligule short, fimbriate. It flowers in August, and is found on calcareous, dry, hills and plains, from southern New York to Wisconsin and southward. It is found abundantly on rocky lands and hill sides in the counties of Orange and Dutchess. Its brilliant red anthers make it very conspicuous in flowering time. Fig. 75*d* represents a culm of *B. curtipendula*, the flowering stalk separated from the culm. Fig. 75*e*, an enlarged branch Fig. 75*f*, a pair of glumes, with the flower lifted out of them.

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19. GYMNOPOGON.—Naked beard grass. Name from the Greek *gymnos*, naked and *pogon* beard. Spikelets of one perfect flower and the rudiment of a second (consisting of an awn-like pedicel, mostly bearing a naked bristle), sessile and remotely alternate on long and filiform rays or spikes, which form a naked, crowded raceme. Glumes lance awl-shaped, keeled, almost equal, rather longer than the somewhat equal membranaceous paleæ, of which the lower is cylindrical involute, with the midrib produced from just below the two cleft apex into a straight and slender bristle-like awn, the upper with the abortive rudiment at its base. Stamens three. Stigmas pencil-form, purple. Leaves short and flat, thickish. It includes two species.

1. *Gymnopogon racemosus.*—The awn of the abortive flower shorter than its stalk, equalling the pointed glumes, not more than half the length of the awn of the fertile flower. Spikes flower bearing to the base, five to eight inches long, soon divergent. Culms clustered from a short root stock one foot high, wiry, leafy. Leaves oblong, lanceolate. Perennial. Flowers in August and September. Grows in sandy, pine barrens, New Jersey to Virginia and southward.

2. *Gymnopogon brevifolius.*—Lower palea ciliate near the base, short awned; awn of the abortive flower obsolete or minute; glumes acute. Filiform spikes long, peduncled *i. e.*, flower bearing only above the middle. Sussex county, Delaware and southward. Fig. 75*g* represents *G. racemosus*, reduced in size. Fig. 75*h* is a magnified spikelet, showing the glumes and floral organs.

20. CYNODON.—Bermuda grass. Scutch grass. Name from *kuon*, a dog, and *odous*, a tooth. In this genus the spikelets are one-flowered, with a mere naked, short, pediceled rudiment of a second flower, imbricate-spiked on one side of a flattish rachis. The spikes usually digitate at the naked summits of the flowering culms. Glumes keeled, pointless, rather unequal. Paleæ pointless and awnless, the lower larger, boat-shaped. Stamens three. Low, diffusely branched and extensively creeping perennials, with short, flattish leaves. It has but one species.

1. *Cynodon Dactylon.*—Glumes linear, compressed, somewhat hispid on the keel. Professor Gray, in the definition of the genus given above, says that the glumes are pointless. They are distinctly pointed in all the specimens in our possession. Paleæ pointless, awnless, the lowest, chartaceous, longest and largest nerved on the edges, boat-shaped, smooth, longer than the blunt rudiment. Spikes

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three to five, about one inch long, generally purplish. Culms six to twelve inches long. Sheaths smooth, longer than their leaves, woolly at the top. Leaves filiform, one to two inches long, rough on the edges, joints near the base covered by the sheaths. Ligule wanting. Fig. 76 is a magnified spikelet, showing the glumes and floret. Fig. 77 is a part of the rachis and two spikelets magnified. Fig. 78 is a magnified view of the palese opened with the blunt rudiment of a second flower. Fig. 79 is the upper part of a sheath and a leaf, showing the hairs which replace the wanting ligule. Fig. 80 shows the appearance of the whole plant, of the natural size, though we have seen it twice as large from the Island of Jamaica. It is of no agricultural use, as far as we know, where the better species will grow. Yet it has a very wide geographical range. It is well known at the south as Bermuda grass and forms a very considerable part of their scanty pastures. The most common pasture grasses of Jamaica, West Indies, were forwarded to us by a friend residing there, and fully one-third of these belonged to this genus, and we are assured that it holds the same numerical rank in most of those islands. It grows on the sandy shores of the southwest coast of Cornwall, but we believe that it is found in no other portion of Great Britain. It is found in Spain, Portugal, Italy, Turkey, Greece, islands of the Mediterranean, north Africa and western Asia. This wide geographical range would seem to indicate that it was intended to serve some useful purpose, if we could only ascertain what that purpose was. It flowers in July and August. It is very useful in the same way that *Calamagrostis arenaria* is, binding loose sands by its long roots, which send out long cord-like stolons that fix themselves firmly in the loose sands by producing at every joint a cluster of strong radical fibres, which cover the surface by a rapidly forming net work, as well as by interlacing below. It is only found growing spontaneously in warm latitudes, and is quite incapable of withstanding the effects of excessive cold and moisture. It suffered in London in the cold winters of 1860–61 quite as much as the *Arundo Donax*, *Tripsacum dactyloides*, and other semi-tropical plants of the order. We are assured that it is identical with the Durva or Doorba grass of Hindostan, where it is the most common and valuable fodder grass of the region. We have never seen this grass, but it is probable that something in the soil or climate of that region increases its size and adds to its nutritive value. If these special qualities could be artificially communicated to the soil of our southern States, where it grows so naturally, it would be a priceless boon to the planters. T. Affiec reports that

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he made five tons of hay from an acre of this grass in two cuttings.

21. Dactyloctenium.—Egyptian grass. Name from the Greek *daktulos*, finger and *ktenion*, a little comb. Spikelets several-flowered, with the uppermost flower imperfect, crowded on one side of a flattened rachis, forming dense pectinate spikes, two to five in number, digitate at the summit of the culm. Glumes compressed laterally and keeled, membranaceous, the upper exterior one awn-pointed. Lower palea strongly keeled and boat-shaped, pointed. Stamens three. Pericarp a thin utricle, containing a loose, globular and rough wrinkled seed. Culms diffuse, often creeping at the base. It has but one species, which is

1. *Dactyloctenium Ægyptiacum.*—Spikes four to five; leaves ciliate at the base; annual. It is found in cultivated fields and yards in Virginia, Illinois and southward. It resembles *Cynodon dactylon*, but is easily distinguished from it by observing that *D. Ægyptiacum* has a spikelet containing several flowers, while that of *C. dactylon* has but one. *D. Ægyptiacum* has one of its glumes *awned*, while both of those of *C. dactylon* are awnless.

22. Eleusine.—Crab grass. Yard grass. Name from *Elusin*, the town where Ceres, the goddess of harvests, was worshiped. Spikelets two to six-flowered, with a terminal naked rudiment, closely imbricate-spiked on one side of a flattish rachis; the spikes digitate. Glumes membranaceous, pointless, shorter than the flowers. Paleæ awnless and pointless; the lower ovate, keeled, larger than the upper. Stamens three. Pericarp (utricle) containing a loose, oval and wrinkled seed. Low annuals, with flat leaves and flowers much as in Poa.

1. *Eleusine Indica.*—Dog's tail or Wire grass. Spikelets about one line long, and about five flowers in a spikelet. Upper glume five-nerved, with scarious edges, broader and shorter than the lower one. Paleæ smooth, the lower one-third longer than the upper. The seed conspicuously wrinkled transversely. Spikes sometimes five or six, but most frequently only two or three; from three-quarters to one and one-half inches long. Rachis bearded at the base. Culm three to twelve inches long, oblique, compressed, branching from the base. Leaves linear, pubescent above, smooth underneath; one to four inches long. Sheath loose; ligule hairy. Flowers through the season. Found in most parts of the world, about houses and cultivated grounds; is very abundant around Goshen, in Orange county,

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New York. It is of no known use agriculturally, except as a colonizer of waste places.

The following are measurements taken from an average specimen: There were fifty-five flowering stems from one root; some of them were quite dried up, others were green, some had just started; the flowering culms were in all stages of growth, most of them had two digitate spikes, all of which were one-sided; the longest culm was seven inches long, the longest spike on it was one and fifteen sixteenths inches long, the shortest one was one and twelve sixteenths inches long. It has two leaves, both the leaves are two and three-quarter inches long, one-eighth inch broad. Distance from the base of the upper leaf to the base of the spikes, three and three eighths inches; some of the culms have a single spike growing three sixteenths of an inch below the two terminal digitate spikes.

Fig. 80*e*, represents a spike of *E. indica*, natural size. Fig. 80*f*, a magnified spikelet. Fig. 80*g*, the same, with the flowers more displayed. Fig. 80*h*, the paleæ, ovary and pistils. Fig. 80*i*, the fruit magnified, showing the seed loose in the utricle. Fig. 80*k*, the wrinkled seed detached.

23. LEPTOCHLOA.—Name from the Greek *leptos*, slender, and *chloa*, grass, from the attenuated spikes. Spikelets three; many flowered (the uppermost flower imperfect), loosely spiked on one side of a long filiform rachis; the spikes racemed. Glumes membranaceous, keeled, often awl-pointed, the upper one somewhat larger. Lower palea three-nerved, with the lateral nerves next the ciliate or hairy margins awnless, or bristle-awned at the entire or two-toothed tip; larger than the upper. Stamens two or three; seed sometimes loose in the pericarp. Leaves flat. Includes two species.

1. *Leptochloa mucronata.*—Glumes more or less mucronate, nearly equalling or exceeding the flowers. Paleæ awnless. Spikes from twenty to thirty, and from two to four inches in length, in a long panicle-like raceme. Sheaths hairy. Annual, flowers in August. Found in fields from Virginia to Illinois and southward. We have never met with this species, the description given above is copied from Prof. Gray.

2. *Leptochloa fascicularis.*—Spikelets three-eighths inch long, on very short pedicels, five to ten-flowered, sometimes having a reddish or brownish tinge; glumes lanceolate, linear, keeled; the upper one twice as long as the lower, minutely toothed on the keel; paleæ hairy-margined toward the base, the lower one two-toothed at the apex with a roughish awn inserted between them, three-nerved,

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greenish upper one two-nerved, mucronate three-quarters of the length of the upper ones; spikes numerous, three to five inches long, united into a panicle-like raceme; culms geniculate-decumbent, branching, six to twelve inches long; leaves four to six inches longer than the culms, the upper ones sheathing the base of the panicle; sheath loose, smooth; ligule toothed. Flowers in August. Found in brackish meadows, from Rhode Island southward along the coast, and from Illinois southward on the Mississippi. Root fibrous. Fig. 80*l*, shows a portion of a flowering branch of *L. fasciculatis*; Fig. 80*m*, one of its spikelets displayed and magnified; Fig. 80*n*, an open flower of the same, showing the toothed paleæ.

24. TRICUSPIS.—Name from the Latin *tricuspis*, three-pointed, alluding to the lower palea. Spikelets three to twelve-flowered, somewhat terete, the terminal flower abortive; glumes unequal; rachis of the spikelet bearded below each flower; paleæ membranaceous or somewhat chartaceous; the lower much larger than the two-toothed upper one, convex, two or three-toothed or cleft at the apex; conspicuously hairy-bearded or villous on the three strong nerves, of which the latter are marginal or nearly so and usually *excurrent* (*i. e.*, running out, as when a midrib projects beyond the apex of a leaf), as is the midnerve especially, into a short cusp or awn; stamens three; stigmas dark purple, plumose; grain oblong, mostly gibbous: leaves taper-pointed; sheaths bearded at the throat; panicle simple or compound; the spikelets often racemose, purplish.

1. *Tricuspis sesleroides.*—Tall red top. Spikelets ovate lanceolate, five to six-flowered, shining, on short pedicels somewhat appressed to the branches, one-third of an inch long, purple; glumes shorter than the flowers, unequal, scarious, mucronate; lower palea hairy toward the base, the three-strong nerves being produced into cusps extending beyond the edges and usually having an intermediate membranous tooth on the edge, the upper palea bordered with minute hairs; panicle loose, at first erect, but finally spreading, sometimes to a foot in width; the branches in pairs or alternate, naked below, hairy in the axils, somewhat nodding. The culm is from three to five feet high, very smooth; leaves from twelve to eighteen inches long, smooth, flat; sheaths bearded in the throat, the lower ones hairy; anthers much exserted; caryopsis oblong, a little gibbous, hollowed on one side. Flowers in August. Fig. 81, is a spikelet; Fig. 82, the upper glume; Fig. 83, the lower glume; Fig. 84, the paleæ. It is found in sandy fields and dry sterile banks, from southern New York to Illinois and southward. It is a showy grass and is not con-

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sidered very valuable, but it is, nevertheless, cut for hay and eaten by cattle where it abounds naturally, as in the mountain meadows of Pennsylvania; it is, however, harsh and wiry, and probably would not be eaten by any cattle that could have access to better. Fig. 85 shows the plant as a whole.

2. *Tricuspis purpurea.*—Sand grass. Glumes shorter than the flowers; paleæ strongly fringe-bearded, the lower with eroded truncate, or obtuse, lateral lobes, two-cleft on the summit, its midnerve produced into an awn between the truncate or awn pointed divisions; awn much shorter than the paleæ, frequently not exceeding the lobes; culms many in a tuft from the same root, ascending, from six to twelve inches high, with numerous bearded joints; panicles very simple, bearing few two to five-flowered spikelets, the terminal ones usually exserted, the axillary ones included in the commonly hairy sheaths. Found in sandy land from Massachusetts to Virginia, along the coast. Fowers in August and September. The plant is acid to the taste.

25. DUPONTIA. Named for M. Dupont, a writer on the sheaths of the leaves of grasses; spikelets, two to four flowered, rather terete; glumes membranaceous, nearly equalling the more remote flowers; a cluster of villous hairs at the base of each flower; paleæ thin and membranaceous or scarious; the lower one convex, scarcely keeled, faintly nerved, entire, mostly acutish, pointless; stamens three; stigmas plumose; ovary glabrous; perennial and chiefly arctic grasses, with linear flat leaves, their sheaths closed at the base, the spikelet in a loose panicle.

1. *Dupontia Cooleyi.*—Tall, two feet or more high; leaves roughish, sparsely hairy above; panicle ample, compound; glumes very unequal, the upper three lines long, scarcely shorter than the spikelet, their midrib and the pedicels rough, the slender rachis conspicuously and unilaterally bearded for its whole length; flowers in the spike, mostly two or three, and a sterile pedicel, whitish; the paleæ longer and of a firmer texture than *Aira cæspitosa*, perfectly entire, acutish, and with a somewhat keel-like, roughish midrib; no trace of an awn. Borders of a swamp, Washington, Macomb county, Michigan. We have never seen this grass, but give Prof. Gray's description. In later editions Prof. Gray describes this as *Graphephorum melicoides.* Fig. 85*a*, shows a magnified spikelet, and Fig. 85*b*, shows a part of the hairy rachis, and one flower of the same.

26. DIARRHENA. Name from the Greek *dis*, two, and *arren*, man, from the two stamens; spikelets several-flowered, smooth and shining,

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one or two of the uppermost flowers sterile; glumes ovate, much shorter than the flowers, *coriaceous* (*i. e.*, resembling leather in texture), the lower one much smaller; lower palea ovate, convex on the back, rigidly coriaceous, its three-nerves terminating in a strong and abrupt *cuspidate* (*i. e.*, tipped with a sharp stiff point), or awl shaped tip; squamulæ ovate, ciliate; stamens two; grain very large, obliquely ovoid, obtusely pointed, rather longer than the paleæ, the cartilaginous shining pericarp not adherent to the seed; a nearly smooth perennial, with running root stocks, producing simple culms, two to three feet high, with long linear lanceolate flat leaves toward the base, naked above, bearing a few short pediceled spikelets one-fifth of an inch long, in a very simple panicle.

1. *Diarrhena Americana.*—Shaded river banks and woods, Ohio to Illinois, and southward. Flowers in August. We know nothing of this grass, and cannot, therefore, tell anything about it beyond Prof. Gray's description. Fig. 85*c*, represents a magnified spikelet. Fig. 85*d*, the grain and paleæ.

27. DACTYLIS. Cock's foot, or Orchard grass; name from the Greek *daktulis*, a finger's breadth. Spikelets several-flowered, crowded in one-sided clusters, forming a branching dense panicle. Glumes and lower palea herbaceous, keeled, awn-pointed, rough-ciliate on the keel, the five nerves of the latter converging into the awn-like point; the upper glume commonly smaller and thinner. Stamens three; grain lance-oblong, acute, free; perennials; leaves keeled.

1. *Dactylis glomerata.*—Spikelets (Fig. 88, natural size) crowded, numerous, unilateral on short rough foot stalks; usually of three florets in ovate clusters at the extremities of the branches. Glumes very unequal, membranous; more or less hairy, particularly on the keel (Fig. 86, magnified). Lower palea (Fig. 87, magnified) ovate lanceolate, rough, ending in a cusp or short awn; rather longer than the glumes; upper palea membranous, fringed on the margin. Anthers very large, yellow. Panicle erect, tufted; the upper part dense. Rachis and branches rough, the lowermost branches spreading and furnished with a tubercle at the base. Culm usually about three feet high. Leaves broadly linear, glaucous, rough, of a dull green, edges minutely toothed; about five or six leaves on the culm. Sheaths rough, striated. Ligule elongated, membranous, often torn at the top. Flowers in May and June. (Fig. 89, the whole plant.) This grass is very widely diffused; it covers the whole of Europe and the adjoining parts of Asia, except in the extreme northern and colder regions, and is met with in northern Africa, as well as in the

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United States. It is described as indigenous in England by the very earliest herbalists, but seems not to have been much known until introduced from this country by the Society of Arts from Virginia. From that time it has retained its popularity, and is to the present day one of the most generally cultivated species. According to the analysis of Mr. Way, it contains of water, seventy per cent; of albuminous or flesh-forming principles, 4.06 per cent; of fatty matter, 0.94 per cent; of heat-producing principles, 13.30 per cent; of woody fibre, 10.11 per cent; of ash, 1.59 per cent. Comparing it with timothy in the light of these experiments, it gives twelve and three quarters pounds less of dry hay to the hundred pounds of grass, and if timothy hay is worth ten dollars a ton, orchard grass will be worth $7.18. According to the Woburn experiments, this grass grown upon a peaty soil yielded a sixth more in weight than on a rich sandy loam, but the produce was of inferior value. On the latter, the grass, when cut on April the 15th, weighed at the rate of about 10,209 pounds per acre, which afforded about 1,190 pounds of nutritive matter. At the time of flowering, the green produce was equivalent to 27,905½ pounds, which lost in drying nearly 16,045 pounds, and produced only 1,089 pounds of nutritive extract. At the period of ripening its seed, a reduction in weight, equal to 1,361 pounds per acre, had taken place, which yielded an increase in dry hay at the rate of 1,413 pounds, and in nutritive extract of about 363 pounds. These advantages, however, were more than counterbalanced by a deficiency in the quantity of the aftermath. Although, as we shall show hereafter, there is a decided objection to the methods pursued by Mr. Sinclair in these experiments, yet it is probable that we shall not greatly err in practically adopting the conclusion that, in a greater degree than any other grass, the cock's-foot yields the greatest degree of nutriment when young; and a great loss is entailed upon those who suffer it to remain too late bofore it is cut.

Scheven and Ritthausen's analysis of orchard grass gives:

Water	65.10
Albuminous	3.00
Fatty	.80
Heat	12.60
Woody fibre	16.10
Ash	2.40

Any one who reads our description of this grass will have no difficulty in recognizing it wherever he may see it; yet it varies so much in different places, and when grown under different circumstances,

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that one who was accustomed to it in one place of its appearance, would not recognize it in another without making a special examination of it. In poor and exposed pastures, for instance, the branches of the panicle are so short and so close together, as to give it the appearance of a single cluster, whilst in rich, sheltered woods, even the secondary branches become so much elongated and spread so widely that one who was only familiar with the first form, might readily mistake it for a different species; in fact, they are as diverse in their appearance as *Agrostis vulgaris* and *A. scabra.* The only genus of the *Gramineæ* at all likely to be mistaken for orchard grass is *Phalaris arundinacea;* but the student will easily distinguish between them by observing that the panicle branches of the latter are flowered nearly down to the rachis, whereas the former are naked for nearly half their length. If he is still in doubt, let him look at the flower. *Dactylis* has its spikelets composed of from three to five flowers; *Phalaris* of only *one* perfect flower; this will settle the matter beyond all doubt.

Its seeds weigh about twelve pounds to the bushel, and it would require from two to three bushels of seed to the acre, were the field seeded exclusively with this grass; but this is very rarely done, as it is almost invariably sown in a mixture with other grasses; in this case from three to five pounds are used, according to the object that the farmer has in view. As we have already stated, the grass varies greatly in size and aspect; it varies in the size of the plants, in their vigor, in breadth of the leaves, and in the color and succulence of its foliage. No grass breeds more truly than this. The seeds from a weak and dwarfish plant will produce puny and innutritious offspring, and those from vigorous and succulent plants will communicate the same qualities to the culms that spring from them. It is important to sow the very best quality of seeds for grasses of all kinds, but more emphatically than in almost every other kind is it necessary to secure the best possible seeds of orchard grass. This is exemplified in the practice of Messrs. Lawson & Son, the world-famous seedsmen of Edinburgh, who, by sowing carefully selected seeds for many generations, have succeeded in establishing a new and improved variety, which is known as Giant cock's foot, and which readily sells twenty per cent above the common, carelessly selected seeds of the orchard grass.

In our systematic description of *D. glomerata* we have stated that it grows about three feet high, and such is generally its altitude; but we have repeatedly seen it five feet in length. The largest crop that

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we have ever seen recorded as growing on one acre was five tons, 1,859 pounds. It is very rare, however, for an acre to yield over two tons even on the most fertile soils when not irrigated, and one ton and a quarter will be a fair average crop on what is called fair grass land. It is admirably adapted for irrigation, and when this is done with the best kind of water, two or three crops may be cut in a single year, and the acreable product will, of course, be greatly augmented.

The testimony that has been collected from all parts of the world for two centuries past establishes the place of this species among the very best of our forage grasses, and we have not the shadow of a doubt that the interests of our graziers and dairymen would be greatly promoted by its more extended cultivation. It is always found in the rich old pastures of England, where an acre of land can be relied on to *fatten* a bullock and four sheep, such as those of Devonshire, Lincolnshire, and the vale of Aylesbury. And it is found equally in the best pastures of this country. It is admirably adapted for growing in the shade, no grass being equal to it in this respect except rough-stalked meadow grass (*Poa trivialis*). It receives the name of orchard grass, by which it is best known in this country, from this circumstance; we have seen it growing in great luxuriance in dense old New England orchards, where no other grass, except *P. trivialis*, would grow at all. It affords a good bite earlier in the spring than any other grass except the meadow foxtail (*Alopecurus pratensis*). It affords a very great amount of aftermath; it is exceeded in this respect by no other grass except Kentucky blue grass (*Poa pratensis*), and it continues to send out root-leaves until very late in the autumn. It is really surprising to see how rapidly it springs up after mowing or being fed off closely. Its sudden reproduction, under these circumstances, completely verifies Virgil's description.

> "Cool dews restore beneath night's transient hours,
> All that the herd each livelong day devours."

Valuable as it undoubtedly is for hay, it is still better adapted to the pasture. Here its merits stand unrivaled; the laceration produced by the teeth of cattle, instead of injuring, actually stimulates it to throw out additional leaves, yielding the tenderest and sweetest herbage. It has been objected against orchard grass, that it is coarse, and is disposed to grow in tussocks; this is no doubt true, but if the meadow is dragged over in the spring with a fine-toothed harrow, and then rolled, this disposition will be completely overcome, and the meadow or pasture will be as smooth as can be desired. It is not well adapted to

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lawns, unless they are mowed as often as once a week, for, as it springs up so much more rapidly than its associates, that smooth, velvety surface, so much prized, cannot be maintained. When sown with other grasses its tendency to form tussocks is very much diminished; indeed, it is always unprofitable to sow it alone in meadows or in pastures, as it stands too thin upon the grounds to make a profitable use of the land, and the filling up of the interspaces with other varieties greatly improves the quality of the orchard grass by restraining its rankness, and making it more delicate. It succeeds best where the subsoil is porous, as in rich sandy loams, allowing its roots to penetrate deeply. Here it developes all its best qualities, and becomes permanently established. But where a thin soil rests upon a tenacious subsoil retentive of moisture, it is not very vigorous; it may be successful at first, but the slight hold of the roots upon such soils makes them liable to be drawn out by cattle, and the massy production of foliage which affords an ample bite and purchase upon the roots so facilitates their destruction, that the pasture soon becomes thinned, and if dry weather ensues it loses in an accelerated ratio, and thus the pasture is ruined.

Mr. Sinclair states, and the statement has been abundantly verified in all countries, that the herbage, when suffered to grow rank or old, for want of sufficient stocking, contains one-half less nutriment than that which is of recent growth. Cattle, sheep and horses eat it with the greatest avidity when it is young, but will not touch it when old; hence the importance, when pastures have been understocked, of going over them with a mowing machine; the orchard grass will then stool out and the cattle will be found eating first on the very spots that they had previously rejected.

28. KŒLERIA. Named by Persoon, in honor of George Lewis Kœler, of Mayence, author of a work on German and French grasses, published in 1802. Spikelets three to seven-flowered, crowded into a dense and narrow spike-like panicle; glumes and lower palea membranaceous, compressed-keeled, obscurely three-nerved, barely acute, or the latter often mucronate or bristle-pointed; the former moderately unequal, nearly as long as the spikelet; stamens three; grain free. Tufted grasses (allied to *Dactylis* and *Poa*), with simple upright culms; the sheaths often downy.

1. *Kœleria cristata.*—Spikelets two to four-flowered; lower palea acute or mucronate; leaves flat, the lower sparingly hairy, ciliate on the margins; panicle narrowly spiked, interrupted or lobed at the base. Fig. 90, glumes, magnified; Fig. 91, the two flowers with their paleæ magnified; Fig. 92, the whole plant; Fig. 92*a*, ovary and pistils.

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29. EATONIA. Named for Prof. Amos Eaton, of Troy, New York, author of a popular manual of botany. Spikelets usually two-flowered, and with an abortive rudiment or pedicel, numerous in a contracted or slender panicle, very smooth; glumes somewhat equal in length, but very dissimilar, a little shorter than the flowers, the lower narrowly keeled, one-nerved; the upper broadly obovate, folded round the flowers, three-nerved on the back, not keeled, scarious margined; lower palea oblong, obtuse, compressed, boat-shaped, naked, chartaceous; the upper very thin and *hyaline* (*i. e.*, transparent or nearly so); stamens three; grain linear, oblong, not grooved; perennial, slender grasses, with simple and tufted culms, and often sparsely downy sheaths, flat lower leaves, and small greenish (or rarely purplish tinged) spikelets.

1. *Eatonia obtusata.*—Spikelets somewhat clustered, two-flowered; glumes unequal, the lower one subulate, the other broad obovate, somewhat coriaceous, scarious on the margin, rough on the keel, shorter than the flowers, three-nerved, obtuse, somewhat truncate; flowers sessile in the glumes; lower palea about equal in length to the upper one, oblong lanceolate, rather acute, contracted at the base; caryopsis oblong, linear, nearly as long as the upper palea, light brown; panicles three to five inches long, oblong, contracted the branches short, erect, racemose covered with spikelets to the base culm about two feet high, sometimes reaching to three feet; leaves a little over one line wide, six to ten inches long, flat, smooth or pubescent, slightly rough on the edges; ligule oblong, toothed at the summit; sheaths somewhat rough, the lower part of the panicle frequently inserted in the upper one. Flowers in June. Dry open woods and fields. From New York to Wisconsin, and southward. Fig. 93, spikelet, showing the glumes, the two flowers and a rudiment; Fig. 94, paleæ, showing them more unequal than they are in our specimens; Fig. 94*a*, the whole plant, showing the panicle more obviously interrupted, and more loosely flowered than in our specimens.

2. *Eatonia Pennsylvanica.*—Spikelets sometimes three-flowered, a yellowish green when young and whitish when old; upper glume oblanceolate, obtuse, but much less so than the preceding, not truncate, sometimes slightly pointed; lower glume linear, both slightly hispid on the back; lower palea somewhat coriaceous, roughened with minute dots, which are denser toward the lower part; panicle very slender, loosely flowered, three to six inches long, branches two or three together; the flowers do not extend quite to the bottom of the branches; anthers and stigmas purple; caryopsis linear, com

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pressed. Flowers in June. Moist woods and meadows. Cattle will sometimes crop the species of this genus when young, but it soon becomes converted into woody fibre, and is then absolutely avoided by all animals within our knowledge, *E. obtusata* may be distinguished from the other species by its denser panicle, and its truncated glumes. The glumes of *E. Pennsylvanica* are not very obtuse. I have never seen the roughened dots on the paleæ of *E. obtusata.*

30. Melica.—An old name from the Greek *meli*, honey. Spikelets, two to five-flowered; the one to three upper flowers imperfect and dissimilar, convolute around each other, and enwrapped by the upper fertile flower. Glumes usually large, scarious margined, convex, obtuse; the upper seven to nine-nerved. Paleæ papery, membranaceous, dry, and sometimes indurating with age; the lower rounded or flattish on the back; from seven to many-nerved; scarious at the entire blunt summit. Stamens three. Stigmas branched, plumose. Leaves flat and soft. Panicle simple or sparingly branched; the rather large spikelets racemose one-sided.

1. *Melica mutica.*—Panicle simple or branched. Glumes unequal; the larger almost equalling the spikelet; fertile flowers two; lower palea naked, glabrous, but minutely *scabrous* (*i. e.*, rough or harsh to the touch) on the nerves. Flowers in June, and is found on rich soil from western Pennsylvania to Wisconsin and southward. Fig. 95 is a magnified spikelet of *M. mutica* expanded, showing the glumes, two flowers and a seed rudiment.

31. Glyceria.—Manna grass. Name from the Greek *glukeros;* sweet, in allusion to the taste of the grain. Spikelets terete or flattish; several many-flowered; the flowers mostly early, deciduous by the breaking up of the rachis into joints, leaving the short and unequal one to three-nerved membranaceous glumes behind. Paleæ naked, of a rather firm texture, nearly equal; the lower rounded on the back, scarious (and sometimes obscurely toothed) at the blunt or rarely acute summit, glabrous, five to seven-nerved, the nerves parallel and separate. Stamens three or two. Stigmas plumose, mostly compound, ovary smooth. Grain oblong, free. Perennial, smooth, marsh grasses, mostly with creeping root stocks or bases, the spikelets in a racemose panicle.

Measurement of a large specimen of *G. nervata* at Minerva, Essex county, N. Y. Culm, four feet one inch long; panicle, seven and a half inches; longest branch of lowest whorl, four inches; the lowest whorl has four branches; the next eight whorls have two branches each; the lowest leaf is six and one-quarter inches long; the

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second (above) six and a half inches; third leaf, six and three-quarter inches; the fourth, seven and a half inches; the fifth, eight and a half inches; sixth, eight and a half inches; seventh, six and a half inches; the third leaf five sixteenths of an inch wide; ligule short, truncated.

1. *Glyceria Canadensis.*—Rattlesnake grass. Spikelets ovate before flowering but afterward much broader, tumid, about two and a half lines long, the sides convex, six to eight-flowered. Glumes much shorter than the flowers, ovate-lanceolate, acute, unequal; the lower one shorter. Panicle large, effuse, the branches semi-verticillate, and finally pendulous, six to eight inches long; at first pyramidal, but the virgate branches at length spreading and pendulous at the extremity. Lower palea rather acute, seven-nerved, ovate, the upper shorter and very obtuse. Stamens two. Styles short. Stigmas purple. Culm from two to three feet high, erect, leafy; the leaves are sometimes longer than the culm, two to three lines wide, roughish. Sheaths entire and a little rough. Ligule ovate, obtuse, lacerate. Flowers July. It is usually found on high elevations, in swampy lands, and by the margins of streams. It is very apt to grow in clumps. Its large and tumid spikelets gave it much the appearance of *Briza media*, and it has been placed in that genus by some botanists; but as the genus *glyceria* is now defined, there is no doubt that this grass must be included in it. It is one of the most beautiful of grasses, and is exceedingly ornamental in grass bouquets. It is abundant on the Catskill and White mountains, and on the Raquette waters of the Adirondacks. Cattle eat it very well in pasture and when made into hay. It has never been analyzed, nor have any physiological experiments been made to test its value. When it and *Glyceria aquatica* stand together, *G. canadensis* is generally eaten first.

Measurement of a pretty large specimen found in Minerva, Essex county, N. Y. *Glyceria canadensis.*—Culm, three feet eight and a half inches long; panicle, nine and a half inches long; the whorl of branches of the panicle has three branches; the central branch is the longest, and measures four and seven-eighths inches; the two lateral ones measure two and three-quarters inches; the second whorl (above) has four branches, as have the third and fourth whorls; the fifth whorl has five branches, and the sixth, seventh, eighth, ninth, tenth and eleventh have each three branches; the topmost leaf is eight and a half inches long and three-eighths of an inch wide; the second leaf (downward) is twelve and a half inches long; the third, fourteen inches long; the

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fourth, twelve and a half inches long; the fifth leaf ten inches long; the sixth, and lowest leaf, seven and a quarter inches.

2. *Glyceria obtusa.*—Spikelets six to seven-flowered, erect, short pediceled, pale, about three lines long. Glumes much as in number one. Lower palea obtuse; the upper as long when old, of a stiff texture, and not very strongly nerved. Panicle dense, oblong, narrow. Culm one to two feet high; quite stout and very leafy. Leaves long and smooth. Flowers in August. It is found in bogs, near the coast, from New England to Pennsylvania. We have no distinct knowledge of its agricultural value.

3. *Glyceria elongata.*—Spikelets three to four-flowered, pale, one to one and one-half lines long, ovate, obtuse, somewhat tumid. Glumes nearly equal, lanceolate, acute, keeled. Paleæ unequal, the lower one rather acute, somewhat prominently seven-nerved, oblong ovate, keeled; the upper one shorter than the lower and very obtuse. Panicle much elongated, racemose, the branches distant, appressed, either solitary or sometimes associated with a smaller one, eight to twelve inches long, sometimes nodding, bearing spikelets nearly to the base. Culm from three to four feet high, simple, erect. Leaves about one foot long and two to three lines wide, nearly smooth. Sheaths entire, smooth. Ligule very short or entirely wanting. Flowers early in July. It is found in swamps and in wet woods and meadows from New England to Michigan and northward. It may be distinguished from No. 2 by its longer and more contracted panicle, and its shorter spikelets, and its earlier period of flowering. We are obliged to confess ignorance of its nutritive qualities. It is sometimes called long-panicled manna grass.

4. *Glyceria nervata.*—Or nerved manna grass. Spikelets three to seven-flowered, but mostly five-flowered, oblong, diffusely panicled, nearly terete, greenish at first, but growing reddish with age. Glumes unequal, the upper one three-nerved and obtuse, the lower scarious on the margin, rather acute. Lower palea oval, truncate, obtuse, prominently seven-nerved, upper one bifid at the tip. Stamens three. Anthers pale yellow. Panicle with capillary branches, loose and somewhat spreading, weak and nodding when young, rough. Culm decumbent or oblique, often branching at the base and rooting at the lower joints, from one to three feet high. Leaves rather long, pale green, somewhat glaucous underneath, the leaves have a fan-like arrangement on the culm, stiff. We copy Mr. Flint's very correct figure, which illustrates it very well, Fig. 96. Fig. 96*a* a spikelet of *G. nervata* magnified. Fig. 96*b* a separate flower with one joint

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of the rachis. Fig. 96*c* the lower half of a lower palea, showing its form (rounded on the back but not keeled). According to Mr. Sinclair's Woburn experiments the produce of an acre was 21,780 pounds, of which 13,612 pounds were lost by drying, leaving 8,168 pounds of dry hay when weighed, at the time of flowering, which gave 1,616 pounds of nutritive matter. When the seeds were ripe the weight of grass was exactly the same as before; its loss in drying was 13,068, and the yield of dry hay was, therefore, 8,712, or 544 pounds more than before, which yielded exactly the same amount of nutritive matter. The product of the aftermath was 9,528 pounds, which gave 521 pounds of nutritive matter. This grass, therefore, stands alone, as no other grass which was experimented on showed the same weight of grass and the same amount of nutrient matter at the time of flowering and the time of ripening its seeds. The amount of aftermath, or rowen, also exceeded most others. It also seems to have the power of enduring cold better than any other. Mr. Sinclair says that in February, 1814, after the very severe winter that preceded it, this grass was green and succulent, while nearly 300 other varieties that grew beside it were more or less injured by the severity of the weather. We have not, however, observed that the grass is any greener or more succulent in our winters than its congeners. We have never seen it growing in this country except in very moist meadows,* where it has come in spontaneously, but it is possible that it might well repay cultivation here. In England it is found in all soils which are not too tenacious. It is well worth while to experiment with it, as Mr. Sinclair found that it possessed very valuable properties, and he believed that it would be a valuable addition to permanent meadows and pastures.

5. *Glyceria pallida.*—Spikelets, much like the preceding, nearly three lines long. Upper glume three-nerved, the nerves very close together, the greater part of the glumes scarious; the lower one much smaller, linear, acute, one-nerved, which is the only part of it which is herbaceous, the rest is scarious; the glumes are quite unconspicuous on the spikelet, and shorter than the paleæ. Lower palea with five green nerves, which are quite conspicuous, the rest scarious, somewhat acute and at length becomes minutely five-toothed; the upper one nerved at the edges and two-toothed at the apex, about as long as the upper one. Stamens three; anthers yellow. Culms one to three feet long, ascending from a creeping base, slender. Leaves

* I have, since this was written, seen it growing in a dry sandy soil in the grass garden of the agricultural department at Washington.

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a pale green, minutely toothed at the edges; one to two lines wide, six to twelve inches long. Ligule oblong, obtuse, lacerate. Panicle weak, four to seven inches long, branches capillary, rough, erect, at length somewhat spreading. Perrennial. Flowers from June to August. Found in shallow water, very abundant at Oneida lake, common at the north. It is widely diffused through the world; the seeds have a sweetish taste, and are largely collected in Holland as an article of food. We know nothing of its agricultural value. Fig. 97 a spikelet; Fig. 98*a* a flower; Fig. 98, Lower palea, showing the five teeth; Fig. 99, upper palea, showing the two teeth; Fig. 100, *Glyceria pallida.*

6. *Glyceria aquatica.*—Or reed meadow grass. Spikelets two to three lines long, oblong compressed, five to seven-flowered with capillary pedicels. Glumes unequal, slightly obtuse, one nerve in the center of each of a reddish color; the upper one larger than the lower; lower palea obtuse, slightly shorter than the upper one, strongly seven-nerved; the upper with two green ribs on tne margin, somewhat two-toothed. Stamens three; panicle ten to sixteen inches long; one stiff and four or five capillary branches are arranged in half whorls alternately on the rachis, about the lower one-third of the branches naked; at first erect and somewhat nodding, but finally expands. Culm stout, upright, three to five feet high and three lines in diameter toward the root. Leaves twelve to twenty inches long, and sometimes half an inch wide, flat, smooth, but occasionally rough, especially on the edges. Sheaths entire. Ligule oblong, chartaceous, with a tooth in the center. Perennial. Rhizoma creeping. Fig. 101 shows the glumes magnified; Fig. 102, the paleæ magnified, but is erroneous in not giving seven nerves to the outer one, and in not showing the two minute teeth on the inner one; Fig. 102*a*, spikelet, natural size; Fig. 103, *Glyceria aquatica.* This grass is made into hay, which is liked by cattle. It flowers in July, it is found in most parts of Europe and is widely diffused in this country in wettish meadows, it would pay the owners of wet meadows to give more attention to its cultivation, as it will flourish in places where few others would grow. Its seeds ripen about the middle of August and weigh thirteen or fourteen pounds per bushel. Lands intended for irrigation, may be sown with about six pounds of seed either in the autumn or the spring, but in very wet lands it is better to set out the roots at the rate of from 3,000 to 4,000 per acre, which will soon spread and cover the whole ground. By its rapid growth, it often obstructs ditches and water courses. It is much valued in England and Scotland for hay. On the banks and

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small islands of the Thames, as well as in the fens of Cambridgeshire and Lincolnshire this grass is mown twice a year, and is dried in sheaves for hay. In the Woburn experiments the grass produced, at the time of flowering, the enormous amount of 126,596 pounds of grass to the acre, which lost in drying 50,638 pounds, and gave 4,954 pounds of nutritive matter. When the seed was ripe, it produced 122,512 pounds of grass, which lost in drying 61,256 pounds, and gave 4,466 pounds of nutritive extract. From this it appears that 478 pounds of nutritive matter, and 14,701 pounds of dry hay are lost by postponing the cutting until the ripening of the seed. Mr. Curtis informs us that in flat countries that do not admit of being drained, this is almost the only grass used for both hay and pasture. It is stated in the Bath agricultural papers, that in the fens of Ely it grows six feet high. The nutritive extract of *G. aquatica* contains a greater amount of sugar than any other grass. He offered a bundle of it to a horse that was grazing on a field of white clover, the animal eat it with a seeming relish, taking a bite of the clover, and then another of the *G. aquatica*, alternately until the whole was consumed. Thus the report of the animal, for once at least, concurred with the report of the chemist. Rev. B. Dacre, of Mosely, has made several experiments with this grass, the results of which prove that it may be cultivated on more elevated situations than has been supposed, and that propagating it by planting the roots, is the best mode. In "the good time coming," we expect to see a wider area of this grass cultivated than has ever been thought of before. At the grass garden, at Washington, I have seen the grass growing on a dry sandy soil, it was much finer and greener than when growing in wet places.

7. *Glyceria fluitans*, or common manna grass.—Spikelets nearly sessile, eight to fourteen flowered, flowers rather distant, from one-half to three-quarters of an inch long, oblong, compressed; glumes unequal, the inner nearly twice as long as the outer, without lateral ribs, obtuse, rounded on the back; paleæ nearly equal in length, the lower one roughish, the herbaceous part eroded at the apex, but the erosions are filled in with a scarious margin which makes the tip of the palea entire, rough, especially on the keel; the upper palea lanceolate, and sometimes longer than the lower, minutely two-toothed; stamens three, yellow; styles short; stigmas white; scales thick and somewhat cordate; caryopsis oblong, sulcate on the upper side; panicle twelve to eighteen inches long, the lower part sometimes concealed within the upper sheath, the branches simple, appressed, bearing the spikelets racemosely; culm three to five feet high, erect or

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ascending; leaves eight to twelve inches long, and two to four lines wide, rough at the edges, and sometimes rough on both surfaces, the lower ones flat, the upper generally folded, the central rib of the leaf extending down the sheath; the upper sheath longer than its leaf; the second sheath extends beyond the first joint; joints about seven, smooth; ligule long, obtuse or pointed, ragged above. Flowers from June to August. This grass is found growing in shallow water, overflowed meadows and wet woods, but will bear cultivation on moderately dry grounds. Schreber says that it is cultivated in several parts of Germany for the sake of the seeds, which form the manna-crop of the shops, and are considered a very great delicacy in soups and gruels. When ground into meal, they make bread, very little inferior to that made from wheat. In Poland, large crops of the seeds are obtained for culinary purposes. The sharp bran obtained in the preparation of the seeds is much approved on the continent of Europe as a medicine for intestinal worms in the horse, its action is mechanical, like cowitch, the pungent hairs on the pods of the *mucuna pruriens*, which are often administered to the human subject as a vermifuge. The horses are kept from water for several hours after taking the bran, as water is supposed to rob it of its efficacy. All graminiverous birds are exceedingly fond of these seeds. We have been familiar with the grass for years, but do not remember to have seen a dozen of the seeds during the whole period, and we have never, in our lives, seen a ripe one, the birds having much sharper eyes than ours, and rising much earlier in the morning, have effectually prevented us from finding them. Trout and, indeed, most fish are very fond of them, wherever *G. fluitans* grows over the banks of streams the trout are always found in great numbers waiting to catch every seed that falls. There is a great difference of opinion among agricultural writers with respect to the fondness of animals for the leaves and culms of this grass. We have often seen the ends of the leaves cropped by cattle, but have never seen the culms or root leaves touched by them. Mr. Sinclair says he once watched a bog to which cattle had access, very carefully, in which, besides *G. fluitans*, there were *Agrostis stolonifera*, *Poa trivialis* and *Alopecurus pratensis*, all of which were eaten down closely, while *G. fluitans* was untouched by any, except the black cattle, and they only eat the extremities of the leaves, just as we observed them do. On the other hand, reliable writers have asserted that cattle, horses and swine were alike fond of it, and that cattle are often mired in the bogs, being enticed into them to get at the young shoots in the early spring; probably

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these discrepant statements have their origin in the different condition of the leaves and culms in different soils and circumstances; but careful observations and experiments are needed before a trustworthy agricultural history of this grass can be obtained. Mr. Sinclair cultivated it in the grass garden at Woburn, for four successive years, and during this period it increased in the amount and quality of produce. On the fourth year of cultivation the produce per acre amounted to 13,612 pounds, which lost 9,528 pounds in drying, and gave 372 pounds of nutritive matter. The seeds have never been known to germinate except when sown directly in the mud. When raised in this way, they may be transplanted to a tenacious clay, and will flourish there very well. The only grasses likely to be mistaken for this, that now occur to us, are *Festuca pratensis* and *F. elatior*, but *G. fluitans* may be readily distinguished by observing the *seven* ribs of the palea and the roughness of its keel, whereas the fescues have but five ribs or nerves, and the dorsal rib is perfectly smooth. We show the glumes in Fig. 104, the paleæ in Fig. 105, a spikelet of the natural size in Fig. 106, and a figure of *G. fluitans*, complete in Fig. 107.

8. *Glyceria acutiflora.*—Spikelets five to twelve-flowered, few and scattered, linear, terete. Glumes unequal, nerveless. Lower palea lanceolate, acute-pointed; shorter than the tapering point of the upper one. Stamens three. Stigmas white. Caryopsis oblong, grooved on the upper side. Panicle simple, elongated, appressed, somewhat nodding. Culm about a foot and a half high. Leaves short, erect, attenuated at the point, three to six inches long, and two lines wide. Ligule elongated. Much resembles the preceding, but may be distinguished by its acute flowers which are one-third of an inch in length, and nearly twice as long as those of *G. fluitans;* its paleæ are also nerveless, while those of the preceding are conspicuously nerved. We can say nothing of its agricultural value.

9. *Glyceria maritima*, or sea spear grass.—Spikelets oblong or linear, with from four to ten florets. Glumes unequal, the inner three-ribbed; the outer rather more than half the length of the inner one. Paleæ of about equal length, the outer one inconspicuously or obsoletely five-nerved, terminating in an acute point, smooth above and slightly hairy at the base; the inner one with two green marginal ribs delicately fringed; grain hardly grooved. Panicle contracted with age; its branches solitary or in pairs, spreading while in flower; unilateral, leaving the rachis behind base; branches smooth to the touch, the lower branches never deflexed. Culms from ten to fifteen

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inches high, erect, smooth, decumbent at the base; the upper sheath longer than its leaf, crowned with an elongated decurrent ligule. Sheaths smooth, tumid; joints about four, smooth. Root perennial, creeping. Flowers in July. Fig. 108, glumes; Fig. 109, paleæ; Fig. 110, *G. maritima*, whole plant. This may be confounded with *G. distans*, especially when the branches are not bent downward; but it may be distinguished by observing that the rachis and branches are smooth to the touch; the central rib extends to the summit; the leaves generally folded. In *G. distans*, on the contrary, the rachis and branches are rough; the central rib of the outer palea does not extend to the summit, and the leaves are scarcely ever folded. One more distinction may be mentioned, which is, that *G. distans* has a fibrous root, while *G. maritima* has a creeping one, as above stated. We are ignorant of its agricultural uses. It is found on the sea coast, especially in the vicinity of salt marshes, and is widely diffused, being found in Lapland, Germany, France and England.

10. *Glyceria distans.*—Spikelets (Fig. 110*c*) three to six-flowered, linear; when young somewhat elliptical; the summit of the lowest floret extends beyond the larger glume. Glumes (Fig. 110*a*) unequal, membranous, three-ribbed. Paleæ (Fig. 110*b*) about equal, the lower truncate obtuse, inconspicuously or obsoletely five-nerved; the middle rib does not extend to the summit; slightly hairy at the base. Leaves mostly flat; branches of the panicle rough, three to five in a half whorl; lower branches generally bent downward. Very much like the preceding; it is very inferior as a pasture grass. Flowers in July. Quite common on the sea coast. The upper part of the culm and the panicle are shown in Fig. 110*d*.

32. BRYZOPYRUM.—Spike grass. Name from *Briza* and *pyros* wheat. Spikelets and numerous flowers compressed; crowded in a densely spiked or capitate panicle. Glumes herbaceous or membranaceous; the lower faintly many-nerved. Lower palea rather coriaceous, flattened, boat-shaped, indistinctly many-nerved, acute, ovary-stalked. Flowers mostly *diœcious* (*i. e.*, having the stamens and pistils in separate flowers or on different plants), pretty large. Leaves crowded on the culms, involute, commonly rigid.

1. *Bryzopyrum spicatum.*—Culms tufted from creeping root stocks; nine to eighteen inches high; spike oblong, flattened, one inch long. Spikelets, Fig. 110*e* enlarged, ovate or oblong, from five to ten flowered; flowers smooth and naked; grain pointed. The pistillate flowers, Fig. 110*f*, are more rigid and almost keeled, with very long plumose stigmas. The sterile, Fig. 110*g*, smaller and somewhat rounded on

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the back. Flowers in August. Is found on salt marshes and shores. We have never seen this grass, and therefore copy Professor Gray's description.

33. POA.—Meadow grass. Spear grass. An ancient Greek name for grass or pasturage. Spikelets ovate or lance ovate, compressed, several (two to ten) flowered, in an open panicle. Glumes mostly shorter than the flowers; the lower smaller. Lower palea membranaceo-herbaceous, with a delicate scarious margin, compressed keeled, pointless, five-nerved (the intermediate nerves more obscure or obsolete), the principal nerves commonly clothed at and toward the base with soft hairs or long and crisped cobweb-like wool, upper palea membranaceous, two-toothed. Stamens two or three. Stigmas simply plumose. Grain oblong, free. Culms tufted. Leaves smooth, usually flat and soft.

1. *Poa annua.*—Low spear grass. Annual meadow grass. Suffolk grass. Spikelets crowded, very short pediceled, from three to seven-flowered, pale green but often variegated with green, white and purple, ovate oblong, the lowest floret extending beyond the large glumes. Glumes unequal, acute, scarious margined, three-nerved, the keel minutely toothed on the upper part. The palea scarious margined, the lower one acute, ovate, five-nerved, the dorsal one having a few delicate hairs on the lower part, the rest smooth, the upper a little shorter, with two green marginal ribs, which are delicately fringed. Panicle erect at first, but spreading as it grows older into a somewhat triangular form, sometimes one-sided, branches mostly single, sometimes in pairs, smooth, the spikelets confined to the upper half of the branches, capillary. Culm smooth, cespitose, six to ten inches high, often decumbent, but usually erect, bearing three or four leaves, the upper one much shorter than the sheath. Leaves pale green, flat, sword-shaped, often crumpled at the margins. Sheaths loose, smooth, surmounted with a membranous oblong ligule rounded at the top. Flowers from April to October. It resembles *Poa pratensis* very much, and also *P. trivialis.* It may be distinguished from the former by its low stature and smaller panicle. The bottom of the floret is *not* webbed; its root is fibrous; the outer palea has no hairs on the lateral nerves of any specimen that we have ever seen; but as Professor Gray says that they are sometimes hairy on the lower part, this in some cases would be an ambiguous test; whereas *P. pratensis is* webbed at the base of the flowers, and the lateral ribs are hairy, and its root is creeping. It may be distinguished from *P. trivialis* by its *smooth* stem, and by its only having one or two

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branches, whereas *P. trivialis* has four or five branches in a whorl and a *rough* stem; from *P. laxa*, by its distinct nerves on the palea, whereas *P. laxa* is very indistinctly nerved, and we could never make out more than three nerves on the palea. If we are correct in this, it will also aid in the diagnosis. Fig. 3 illustrates this grass as a whole. Fig. 4 is a magnified spikelet, but is more acute and has more flowers than is often met with. Fig. 5 is a floret showing the paleæ; Fig. 6, the glumes, and Fig. 7 the ovary, pistils, stamens and squamulæ. This is the most widely diffused of any of the grasses, being almost co-extensive with the northern hemisphere, accommodating itself to almost every variety of soil and climate, and is found on elevations of 4,000 feet above the sea. In the early period, when the cultivation of grasses was just beginning, it was quite a favorite. Stillingfleet, a very high authority, and one of the earliest writers, states that there were whole fields of it in High Suffolk without the intermixture of any other grasses, and that it was there considered preferable to any other for the feeding of dairy cows. Since that early time, it has fallen into perhaps undeserved disgrace, being now looked upon as an intrusive weed, the pest of gravel walks and brick and stone causeways. Its size is too diminutive for the hay crop, but as a pasture it is greatly relished by cattle, and, as far as it goes, is very nutritive, and gives a fresh young bite from spring to fall. Another objection urged against it is, that it bears seed so abundantly; that those that are ripened in the spring germinate and bear other seeds by the fall so that, though it is a dwarf, yet it will drive out other grasses. This is certainly untrue; on the contrary, it is soon banished where larger grasses grow vigorously, as we have often seen them do. It is only in places which are very much tramped, such as pathways, that it excludes other grasses. This may be often noticed in public parks and village greens, where *P. annua* is about the only grass that will maintain its foothold. From the causes above mentioned, it is very difficult to extirpate it from gardens and gravel walks, and in these positions, it is indeed a nuisance. It can only be banished by removing it by hand as fast as it makes its appearance, or by strewing salt over it from time to time until it has been destroyed. Although it is described as an annual, it is, nevertheless, in some cases, equivalent to a perennial. Its partially decumbent stems sometimes root laterally, the bases of which remain and form new tufts around the old ones. This modification of its general habits is quite noticeable on well preserved lawns which are frequently mown and rolled, or on the borders of foot paths where it is

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liable to be trodden upon from time to time; but in no instances do we see any tendency to the extension of creeping branches or stolons from the bases of the stems. Sometimes, on the other hand, as Mr. Bentham remarks, it will germinate, flower, ripen its seeds and die away in the course of a few weeks. This occurs most frequently in very dry weather, and it is probably owing to its inability to stand a drought, that its present unpopularity must be chiefly traced; but this unpopularity has never extended to the birds, the whole feathered tribe being ravenously fond of its seeds; even hens and turkeys, and especially their young, may be seen searching for them at all times, and stripping them with the most earnest avidity from the diminutive panicles. Many poultry fanciers consider a patch of this grass, easily accessible to the fowl yards, as indispensable for the successful rearing of the chickens. Mr. Way analyzed this grass in flower and also as dried hay with the following results: Water, 79.14 per cent. Sweet scented vernal grass and meadow fox-tail exceed it in this respect, the former by 1.21 and the latter by 1.16 per cent. Albuminous or flesh forming principles, 2.47 per cent. Only Italian rye grass, sweet scented vernal and meadow fox-tail contained a less amount of these matters. Fatty matters, 0.71 per cent. Annual rye grass, soft Brome grass, meadow fox-tail and sweet scented vernal were the only grasses which contained a less amount of fatty matters. Of heat-producing principles it contains 10.79 per cent. *P. trivialis*, *Bromus mollis*, sweet scented vernal and meadow fox-tail were the only grasses inferior to it in these principles. Woody fibre, 6.30 per cent. It contains less of this substance than any other grass on the list. Of ash, 0.59. It also shows less mineral matter than any other. When this grass was dried at a temperature of 212 Fahr., it contained of albuminous matters 11.83 per cent, of fatty matters 3.42 per cent, of heat-producing matters 51.70 per cent, of woody fibre 30.22 per cent, of mineral matter 2.83 per cent. The Woburn experiments give 5,445 pounds of grass as the produce of an acre, which was reduced to 1,905 pounds when dry, and yielded 212¼ pounds of nutritive matter. It will be seen that both these trials concur in showing that this is among the least nutritive of our grasses.

2. *Poa laxa.*—Few-flowered, Alpine meadow grass. Spikelets about two and one-half lines long, ovate, three to five-flowered, but the terminal flower often imperfect, indeed, we may say it is always so when five-flowered. Glumes, Fig. 110*h*, nearly equal, acute, ovate lanceolate, slightly rough on the keel, the inner one three-ribbed, the

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outer, without lateral ribs. The paleæ, Fig. 110*i*, acute, hairy, and somewhat webbed at the base. The outer palea of the lowest floret, Fig. 110*k*, indistinctly three-ribbed, the lower half hairy; the inner one rather shorter, with two green ribs at the margins, finely fringed. Panicle nodding, often racemose, contracted, branches mostly solitary or in pairs, short, smooth, about one to two inches long, often flexuous, roughish. Culms upright, cespitose, four to nine inches high, bearing two or three leaves, often tufted at the base. Leaves generally less than a line wide, glaucous, smooth, roughish on the edges. Upper sheath longer than its leaf, crowned with a long, acute ligule. Root perennial, fibrous, somewhat creeping. It is found on high mountain tops, on Mount Marcy, the highest mountain in New York. Unknown in agriculture. It is nearly allied to *P. alpina*, which is found in Canada, and may be found hereafter in this country. It differs from it in its contracted panicle, fewer flowered spikelets, narrower leaves, and in the ligule being lanceolate.

3. *Poa brevifolia.*—Spikelets large, three to four lines long, pale green, though sometimes tinged with purple, loosely three to five-flowered; large glume obtuse, smaller one more acute. Paleæ obtuse, lower palea scarious at the apex, villous below the middle of the keel and marginal nerves, rather obscurely nerved, cobwebby at the base. Panicle having the branches mostly in pairs or sometimes in threes, naked below, long and capillary hanging loosely. Flowers in April and May. Culm flattish, one or two feet high, stoloniferous from the base, two to three-leaved; lower leaves nearly as long as the culm, the upper leaves very short (one-half to two inches long) lanceolate, all abruptly cuspidate tipped. Rocky or hilly woodlands, Pennsylvania, Virginia, and sparingly westward.

4. *Poa flexuosa.*—Flowers much as in No. 3, except that the lower palea is prominently nerved and has *no* web at the base, the panicle is more effuse, its branches from two to four inches long to the spikelets or first ramification. Culm slender, its leaves all linear, two to five inches long and gradually taper pointed. Flowers from February to May. Dry woods, from Virginia and Kentucky, southward.

5. *Poa alsodes.*—Spikelets pale green, generally three-flowered, ovate acute, slightly compressed. Glumes unequal, lance linear, very acute, the dorsal rib minutely toothed on the upper part. Outer palea of the lowest floret obscurely five-nerved, the lower part of the dorsal and two marginal ribs hairy, the intermediate ribs generally smooth, the upper one strongly bicarinate, a narrow cobwebby tuft at

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the base. Culm about two feet high, slender, erect, roughish; leaves narrowly linear, acute, flat, the uppermost two to four inches long; the upper sheath not longer than its leaf, with a very short, obtuse ligule, which is sometimes almost wanting. Panicle narrow, the capillary branches appressed when young, and mostly in threes and fours. Flowers in May and June. Found on hill sides and in woods, from New England to Wisconsin. Fig. 111, glumes; Fig. 112, the floret; Fig. 113, the lower palea, which represents the nerves or ribs too strongly; Fig. 114, *Poa alsodes*, the whole plant. It flourishes on mountain sides, from 1,000 to 3,000 feet above the sea; but is very well adapted for lawns and for thick shady places, where few other kinds will grow. The seeds weigh about fifteen pounds to the bushel. When sown in exposed situations it is frequently covered with rust just before coming into flower, though this is not the case when under shelter, and it is much less so in dull, lowery weather than in sunshine. According to the Woburn experiments, there were at the time of flowering 9,188 pounds of grass on an acre, which lost in drying 5,283 pounds and gave 574 pounds of nutritive matter. At the time when the seeds were ripe, the produce of an acre was 4,764 pounds, which lost 2,858 pounds in drying and gave 241 pounds of nutritive matter. Few grasses suffer as much as this by late cutting, the loss of nutritive matter being 332 pounds.

6. *Poa debilis.*—Spikelets often but two-flowered, pale green, broadly ovate, about two lines long. Glumes somewhat unequal, obscurely three-nerved, oblong lanceolate, acutish. Lower palea with narrow scarious tip, webbed at the base, quite obtuse, slightly three-nerved, the upper palea with two roughish keels. Panicle loose, somewhat spreading, branches in threes and fives, sometimes in pairs, with few flowers, roughish, short, bearing the flowers at their extremities, flexuous. Culm weak, one and a half to two feet long, erect, smooth. Leaves one to two lines wide, lance linear, acute, soft, rough on the margin. Sheaths smooth, closely embracing the culm; ligule oblong, acute. Flowers in May. Found in rocky woodlands, from Rhode Island and New York to Wisconsin.

7. *Poa sylvestris*, as described by Professor Gray. Culm flattish, erect, branches of the oblong pyramidal panicle short, in fives or more, lower palea villous on the keel for its whole length, and on the margins below the middle, sparingly webbed at the base. Flowers in June. Rocky woods and meadows, Ohio to Wisconsin, Kentucky and southward. We have not seen this grass.

8. *Poa serotina.*—False red top. Fowl meadow. Spikelets a

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little over one line long, acute, compressed, two to three-flowered, distinctly pediceled, sometimes with a purplish tinge. Glumes somewhat unequal, the outer longest, very acute, three-nerved, nearly as long as the lowest flower, the shorter glume one-nerved, lanceolate, rough on the keel. Paleæ lanceolate, slightly webbed at the base. Lower palea obscurely five-nerved, yellowish at the tip, slightly hairy below on the keel, acutish; upper palea very acute. Panicle six to ten inches long, the whorls somewhat distant on the rachis. Branches mostly whorled in fives, varying considerably in length (one and a half to six inches), rough, the lower part naked, the upper ones *flexuous* (*i. e.*, curving in opposite directions, in a zig-zag way), erect when first developed, but spreading out loosely as they grow older. Culms erect, two to three feet high, growing in tufts, but nonstoloniferous. Leaves flat, narrowly linear, three to six inches long, about two lines wide. Ligule elongated. Flowers in June. Wet meadows, and especially on the low banks of streams. This species has a very delicate appearance when in the latter part of the summer its branches are all widely expanded. We give a figure of it, copied from Mr. Flint's work on grasses. Fig. 115 is a spikelet magnified; Fig. 116, the paleæ; Fig. 117, *Poa serotina*, whole plant. The lower palea in the figure 117 does not show the keel, and shows the lateral nerves more distinctly than they appear in the plant. The upper palea is shown much less acute than it is, nor have we ever seen it with rough edges, as there shown. The fine appearance which the grass presents when at maturity has led several experimentalists in Europe to cultivate it extensively, but usually with unsatisfactory results, as it produces very little aftermath. Nevertheless, some have recommended it for permanent pastures, as its season of greatest growth is in that part of the season between the ripening and after yield of most other grasses. In this case the amount of seed sown should not exceed two pounds per acre. One of our earliest agricultural writers says of this grass in 1749: "There are two sorts of grass, which are natives of the country, that I would recommend. These are Herd's grass and fowl meadow, sometimes called duck grass and sometimes swamp wire grass. It is said that Herd's grass (timothy) was first found in a swamp in Piscataqua, by one Herd, who propagated the same; that fowl meadow grass was brought into a poor piece of meadow in Dedham by the ducks and other wild water fowl, and therefore called by such an odd name. It is supposed to be brought into the meadows at Hartford by the annual floods, and called there swamp wire grass. Of these two sorts of natural grasses the fowl grass

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is much the best. It grows tall and thick, makes a more soft and pliable hay than Herd's grass, and consequently will be more fit for pressing in order to ship off with our horses. Besides, it is a good grass, not in abundance inferior to English grass. It yields a good burden—three loads to an acre. It must be sowed in low, moist land. This grass has another good quality which renders it very valuable in a country where help is so much wanting. It will not spoil or suffer, although it stand beyond the common times for mowing. Clover will be lost in great measure if it be not cut in proper season. Spear grass, commonly called English grass, if it stands too long, will be little better than rye straw. If this outstand the time it is best to let it stand till there comes up a second growth, and then it will do tolerably well; but this fowl grass may be mowed any time from July to October. * * * This I wondered at; but viewing some of it attentively, I think I have found the reason of it. When it is grown about three feet high it then falls down, but doth not rot like other grass when lodged. In a little time after it is thus fallen down, at every joint it puts forth a new branch; but now to maintain this young brood of suckers there must be a plentiful course of sap conveyed up through the main stem or straw. By this means the grass is kept green and fit for mowing all this long period."

We have had some misgivings about giving the results of the Woburn experiments as belonging to this grass, as Mr. Sinclair says that the grass which he calls by this name, has five-nerved glumes, and the nerves of the palea are quite prominent, whereas our grass has a three-nerved glume, and the nerves of the palea are quite obscure. Mr. Sinclair's *P. serotina* seems, generally, five-flowered, while ours is usually three-flowered, and very rarely five-flowered. With this caution, we give the results of the Woburn experiments as applicable to our grass, because Mr. Sinclair gives the same peculiarity as quoted from Mr. Eliot, above; he says: "In long continued moist weather the lower joints send up flowering culms;" and again: "It will appear remarkable that the grass of the latter-math should contain more nutritive matter than the grass at the time of flowering; but this is owing to the property it possesses, of sending forth a succession of flowering culms till the frost arrests it; and hence the trivial names, *serotina* and *fertilis*, late flowering and fertile meadow grass, as quoted above." This identity of habit would seem to indicate that they were specifically identical, notwithstanding the differences which we have mentioned. The growth of *P. serotina* at the grass garden at Woburn, was at the rate of 15,654 pounds to the acre

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at the time of flowering, which lost 9,000 pounds by drying, and gave 734 pounds of nutritive matter. At the time of ripening the seed, the produce of an acre weighed 14,973 pounds, which lost by drying 6,738 pounds, and gave 1,169 pounds of nutritive matter, which is 436 pounds in excess of the nutritive matter given at the time of flowering, and shows that the former exceeds the latter in nutritive matter in the proportion of five to three. The production of the aftermath or rowen, was 4,764 pounds, which gave 111 pounds of nutritive extract. The proportional value, therefore, which the grass of the aftermath bears to that at the time of flowering, is as three to six, and to the grass at the time the seed is ripe, as three to ten.

Mr. Sinclair says: "In regard to early growth this grass stands next to the meadow foxtail, cocksfoot, and tall oat grass. The herbage is more nutritious than that of either of these grasses." Mr. Host mentions that it is natural to moist pastures and the banks of rivers; and Schrader remarks also, that in Germany it grows in meadows, vineyards, marshes, walls and elsewhere, not unfrequently. I have found it to grow on almost every kind of soil; but it attains to the greatest perfection in a rich moist one. Hares and rabbits are very fond of it. It is one of those grasses that thrive best when combined with others; it will not make a superior turf of itself, but it adds much to the value of a sward from its nutritive qualities and powers of early and late growth. As it perfects an abundance of seed, it may be easily propagated. Sir Humphrey Davy has shown that its nutritive matter consists of mucilage, sixty-five; saccharine matter or sugar, six; extractive matter, seven.

We give the measurement of an average plant of *Poa serotina.* Culm, twenty-three inches long; panicle, five inches. The paniele is composed of seven whorls of branches. The two lower whorls have five branches each, the longest branch of the lower whorl is two inches long. The fifth whorl has four branches, the fourth, three branches, the rest have two branches. From the base of the panicle to the base of the upper leaf is two and one-half inches. The upper leaf is four inches long; the second, four and one-fourth inches; the third, three and three-fourths inches; the fourth and fifth were broken off. Spikelets one-eighth inch long. Glumes, two-thirds of the length of the spikelet.

9. *Poa nemoralis.*—This is very much like the last (No. 8), except that the spikelets are generally five-flowered, the flowers and glumes more sharply acute, and the ligule is obsolete or very short. Found in Wisconsin and northward.

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10. *Poa trivialis.*—Rough stalked meadow grass. Spikelets, mostly three-flowered, sometimes five-flowered, short pediceled, a little over a line in length, pale green; glumes unequal, the outer longest and scarious on the margin, three-ribbed, the inner linear, keeled; flowers slightly webbed at the base (our illustration, Fig. 119, shows too much of web), and a little hairy on the keel. Paleæ acute, lower palea five-nerved, scarious at the apex, lateral nerves smooth; inner palea shorter, with two marginal nerves delicately fringed. Panicle pryamidal, diffuse, the branches rough, crowded with the flattened spikelets nearly to the base, mostly in whorls of five. Culm two to three feet high, rarely over two feet; erect, decumbent at the base, sometimes throwing out suckers, roughish; sheath rough when rubbed from below upward, striated; leaves very narrow, flat, rough on both faces; ligule long, pointed, especially the upper ones. Flowers in July. Found in moist meadows and shady places. Root fibrous.

Its appearance resembles that of *P. pratensis* very much, but may be readily distinguished from it by its coming into flower from three to four weeks later, by its long acute ligule, by its rough sheaths and culms, and by its fibrous roots; whereas in *P. pratensis* the sheaths and culms are smooth, the ligule is blunt and the root is creeping.

Poa trivialis mixes very well with orchard grass in all shaded positions, its produce is twice as great when mixed with other grasses as it is when sown by itself. It luxuriates on dripping banks, and is admirably adapted to thick shaded city parks, as it bears shade well and will stand trampling as well as *P. annua.*

It attracted the attention of graziers very early, in England, under the name of Orcheston grass. John Worlidge, author of the Systema Agricultura, published in 1681, gives the following enormously exaggerated account of it: "At Maddington, in Wiltshire, about nine miles from Salisbury, grows a grass, in a small plot of meadow ground, which grass, in some years, grows to a prodigious length; sometimes twenty-four feet long; but not in height as is usually reported; the length being caused by the washing of a sheep down that the rain in hasty showers brings with it much of the sheeps dung over the meadow; so that, in such springs as are not subject to such showers, this grass thriveth not so well." No such grass has ever been seen in this country, and probably the alleged growth was given on erroneous information. It is not adapted to places where it is frequently cut with the scythe, such as open lawns, as it cannot endure much sunshine or dryness, and soon dies out under such circumstances Although this grass is not, strictly speaking, stoloniferous; yet, as we

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have said above, it does send out roots from its decumbent stems, and these roots are very apt to be raised by the rake or broom when the lawns are cleared. Ten or twelve pounds of the seed are sown alone, but probably this will never be done as it is so much more productive when sown in combination with others. The seeds weigh about fifteen pounds to the bushel. M. Way's analysis shows that *P. trivialis* contains of albuminous or flesh forming principles, 2.58 per cent; of fatty matters, 0.97 per cent; of heat producing principles, 10.54 per cent; of woody fibre, 10.11 per cent; of mineral matter, 2.20 per cent. Messrs. Scheven and Ritthausen give somewhat different figures as the results of their analysis of this grass in Germany, they, like Mr. Way, made their analysis when the grass was in flower. Their results were as follows: Albumen, &c., 2.3 per cent; fatty matters, 0.8 per cent; heat producing principles, 8.4 per cent; woody fibre, 8.8 per cent; mineral matters, 1.6 per cent. In the grass experimented on by M. Way, there was 73.60 per cent of water, and in the German experiments there was 78 per cent.

According to the Woburn experiments, the produce of this grass per acre, when in flower, was 7,486 pounds, which weighed when dry 2,246 pounds, which gives just seventy per cent of water. The nutritive matter extracted from it was 233 pounds. The produce, when the seeds were ripe, was 7,827 pounds, which weighed 3,522 pounds when dry, and yielded 336 pounds of nutritive extract. The produce of the aftermath, per acre, was 4,764 pounds, which gave 223 pounds of nutritive extract. It would appear from these experiments that the hay made when the seeds were ripe contained 102 pounds more of nutritive matter than when it was in flower. These experiments certainly ought to be repeated, it may be correct that there is more nutriment in hay cut when the seed is ripe, but it is very certain that all animals eat the hay cut when in flower with much greater avidity and apparent relish. Few grasses are better relished by cattle, and spots in pastures where it grows are always found to be closely cropped. It resembles *P. pratensis* so closely that farmers will desire to know how they may discriminate the seeds. The chief mark of distinction is the woolly web, of which we have spoken in the botanical description; this web is very conspicuous in *P. pratensis* and its fibres interlacing entangle the seeds in large bunches; but in *P. trivialis* the web is much smaller, and the seeds are very little entangled with each other. With the aid of a lens, they can be distinguished with great precision. The seeds of *P. pratensis* are more acuminate and appear *concave* on their face. The seeds of *P. trivi-*

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alis are shorter, rounder, and quite *flat* on the face. It does not bear severe frosts as well as other members of the family, nor does it start as early in the spring, but as soon as the weather becomes warm it grows very fast and produces a large amount of root leaves. Its range of altitude does not extend more than 2,000 feet above the sea. Fig. 118, the glumes; Fig. 119, the paleæ; Fig. 120, *Poa trivialis*.

11. *Poa pratensis*—Green grass. June grass. Smooth stalked meadow grass. Kentucky blue grass. Flowers and spikelets much as in No. 10. It is chiefly distinguished by the woolly web at the base of the floret, and the hairs on the lateral nerves of the palea; the inner palea is a very little shorter than the outer, and is occasionally bifid at the summit. The culms are generally smooth, as are the sheaths, but they are occasionally a little rough; the upper sheath is much longer than its leaf. Root creeping. Ligule blunt. Flowers the latter part of May. It is indigenous in all the northern States, and chiefly affects calcareous soils.

No grass varies so much from alterations of soil and climate and exposure, as this. The flowers are sometimes tumid and tinged with red; under other circumstances, they are of a pale green, and compressed. The culms and leaves are sometimes of a dark bluish green, sometimes of a pale yellowish green; sometimes one foot high, and at others over three feet. British authors enumerate six or seven subvarieties of it with a view of classifying these differences; we have representatives of most of them in this country. This great difference of habit causes a very different value to be assigned to it in different sections of the country. Thus Mr. Klippart says that it is very much in favor in southern Ohio, whilst in northern and northeastern Ohio it is considered a very unwelcome guest in the grass lands. A Kentucky farmer, quoted by Mr. Flint, says of it: "In our climate it is not only the most beautiful of grasses, but the most valuable of crops. It is the first deciduous plant which puts forth its leaves here, ripens its seeds about the tenth of June, and then remains green, if the summer is favorable in moisture, growing slowly till about the last of August, when it takes a second vigorous growth until the ground is frozen by winter's cold. If the summer is dry, it dries up utterly, and will burn if set on fire, but even then, if the spring growth has been left upon the ground, it is very nutritious to all grazing stock, and especially to sheep and cattle and all ruminating animals. When left to have all its fall growth, it makes fine winter pastures for all kinds of grazing animals. Cattle will not seek it through the snow, but sheep, mules and horses will paw it off and

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get plenty without any other food. When covered with snow, cattle require some other feeding; otherwise, they do well all winter upon it. It makes also the best hay. I have used it for twenty years. It should be cut just as the seeds begin to ripen, well spread and protected from the dew at night. When properly cured, stock seem greatly to prefer it to all other hay." Thus much for the Kentucky farmer, who testifies that it is about as good as any grass can be. Dr. Darlington tells us, in his agricultural botany, that "It is, indeed, as Muhlenberg terms it *optimum pabulum*, being decidedly the most valuable of all the grasses known to our pastures." Prof. Buckman, of the Royal Agricultural College at Cirencester, says that "it yields a good bulk for the rick, and sends up a quantity of herbage for the aftermath, which is less injured by the cold and other climatic changes than almost any other species." We have extracted these widely differing opinions respecting this grass, that our readers may see how little is really known about the grasses and how imperfectly our observations of them have been made. This is one of the most widely diffused grasses in the world. We have had the amplest opportunities for observing it, and yet we can come to no agreement upon its merits. Some things about it are admitted upon all hands. 1. It enters into the composition of the best meadows and pastures in Europe and America. 2. The famous pastures of Kentucky, which will fatten animals faster than any other in the known world, are filled with this grass. 3. The fine meadows and pastures of Vermont, on the western slope of the Green mountains, contain a very large proportion (at least two-thirds) of it. 4. Wherever the sweetest and best keeping butter is made, this grass will occupy a very conspicuous place in the pastures; the best butter *cannot* be made where this is wholly missing in the pasture. 5. Although some grasses start earlier in the spring, yet it affords a good bite much earlier than most species. 6. There is no grass known that bears the extreme cold as well as this, even as far north as Vermont; after lying exposed to the cold and snow all winter it is eaten greedily by the cattle in the spring, and they are found to thrive upon it; sheep and even horses will paw away the snow in winter and eat the grass beneath with great avidity. 7. It only sends up one flowering culm in a season, and these stand far apart; hence, at the first cutting, the burthen of hay is less than that afforded by several other species, but in August there is a great growth of root leaves which gives a heavy bulk at the second cutting; the rowen, which is more abundant than any other, fully makes up for the deficiency of the first crop. 8. It succeeds in light lands where fibrous

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rooted grasses would fail. 9. Its nutritive properties, as given by Mr. Way, are as follows: In an hundred pounds of grass there are 67.14 pounds of water; 3.41 pounds of albuminous or flesh forming principles; 0.86 pounds of fatty matters; 14.15 pounds of heat forming principles, such as sugar, gum, &c.; 12.49 pounds of woody fibre, and 1.95 pounds of mineral matter or ash. 10. According to the analysis of Scheven and Ritthausen, *Poa pratensis* gave for 100 pounds of grass, sixty-two pounds of water, four pounds of albuminous matter, 1.1 pounds of fatty matters, 15.4 pounds of heat producing principles, 15.6 pounds of woody fibre, and 1.8 pounds of ash. 11. The Woburn experiments show the production of an acre to be 10,209 pounds, which lost 7,337 pounds in drying, and gave 279 pounds of nutritive matter. When the seed was ripe, it yielded 8,507 pounds to the acre, which lost 5,104 pounds in drying, and gave 199 pounds of nutritive matter. The produce of the aftermath was 4,083 pounds to the acre, and yielded 111 pounds of nutritive matter.

The discrepancies in these estimates of its nutritive value are undoubtedly due in a great measure to differences in the soil and climate of the places of its growth. We have never seen the culms longer than two and a half feet. Its average height in the regions that we are most acquainted with does not exceed eighteen inches. We have never seen any record of its producing more than three tons of hay to the acre, and have never actually seen a greater yield than one ton to an acre. It is well adapted for irrigation. When irrigated lands are ridged this always occupies the crowns of the ridges. Its favorite habitat is a limestone soil, which, if not too dry, will produce it in the greatest abundance. It is found in positions 3,000 feet above the level of the sea, but its valuable qualities are not manifested over half that altitude. The seeds are acuminate or pointed, furrowed on the flat sides, and are furnished with a thick, woolly web, which entangles the seed. It weighs about thirteen pounds to the bushel. With the aid of a glass they may be clearly distinguished from the seeds of *P. trivialis*, the latter being shorter, rounder and nearly quite flat on the face. Dr. Darlington says that it is unnecessary to sow the seed in Pennsylvania if the field is well limed and manured. It will at once take possession of the land and grow vigorously. Hence in that region the prevalence and the luxuriant growth of this grass is one of the best evidences that the land is in good condition and well managed. In many parts of Illinois, where the prairie is once depastured, although not a spear of this grass was seen before, the whole ground will be covered with it, to the complete

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exclusion of the former prairie plants. In poor lands, and in those ill adapted for this grass, its growth is exceedingly dwarfish, and it would hardly be recognized by a superficial observer as belonging to the same species as that which he sees in more favored localities. It is probably owing to this cause that so many contradictory statements have been given with respect to its qualities. The straw of this grass, when bleached, is plaited like leghorn for bonnets, which are quite equal to the leghorn in beauty, and superior in fineness. None of the grasses surpass it in the beauty of its forms and the gracefulness of its movements. Nowhere can we find more fairy-like delicacy of structure and contour, more graceful curves of motion, or greater softness and purity of color, than in the expanded panicle of *Poa pratensis*. Fig. 121, glumes; Fig. 122, paleæ; Fig. 124, ovary and appendages; Fig. 123, lower palea; Fig. 125, *Poa pratensis*.

12. *Poa compressa*.—Blue grass. Wire grass. Flat-stalked grass. Spikelets ovate-oblong, flat, generally five or six-flowered, the summit of the lower floret scarcely extending beyond the larger glume, short pediceled. Glumes acute, nearly equal, three-nerved, often tinged with purple. (Fig. 126.) The lower palea (Fig. 128), three-nerved, sometimes two intermediate nerves are indistinctly manifested, the lower part of the nerve hairy. There is usually a delicate web at the base of the flowers, but we have repeatedly been unable to find any trace of it in undoubted specimens. The inner palea (Fig. 127) has two marginal ribs delicately fringed. The panicle is somewhat spreading in flowering time, but otherwise contracted; the branches in pairs or threes, short, flexuous, rough, often one-sided, the lowermost rather remote. Culm much compressed, decumbent, nine to eighteen inches long, usually about a foot long, geniculate at the base. It bears four or five leaves with smooth, striated sheaths. The leaves are smooth, short, linear, keeled, of a dark bluish green color. We know no grass of so dark a color except perhaps some specimens of *Festuca nutans*. Upper leaf about equal in length to its sheath. Perennial. Rhizoma creeping. Flowers in June and July. It seems to be the prevalent opinion among botanists that it was introduced from abroad; but in some regions it certainly appears to be indigenous. It is found in dry fields and banks. Frequently it may be seen growing in the joints of slaty rocks. It is also often found in damp clays, which are intermingled with gravel and small boulders, and it would be difficult to say in which of these soils it flourishes best. It never forms a close turf, and is rarely found intermixed with other grasses. Hence it never yields a great bulk of hay, but this bulk weighs very

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heavily, so that the hay from an acre will weigh a ton or a ton and a half. We have often cut this amount from land on which a person unacquainted with the grass would not expect to get half a ton. It is certain that cows that feed upon it both in pasture and in hay give more milk and keep in better condition than when fed on any other grass. Horses fed on this hay will do as well as when fed on timothy hay and oats combined. This we have verified abundantly. The crops are remarkably even; it rarely suffers from excessive wetness or dryness. Sinclair says that heavy manuring very slightly increases the crop. This differs from our experience. We never, indeed, succeeded in making a thick sod, but we have by manuring caused the culms to approximate more closely than they did before, and their length has been increased to two feet, while the diameter has been at the same time enlarged. The objection to the wide interspaces between the plants may be obviated by sowing the seeds of some other grass flowering about the same time with it. Perhaps *P. trivialis* would be found to answer the purpose. It is one of the hardiest grasses known, and will grow in many places where no other species will flourish. We have seen it growing vigorously in the coarse debris formed by slates of the Hudson river series, on rocks very slightly covered with soil, on steep river banks and under clumps of thick standing trees; but it is perhaps rather better suited to moist, gravelly clays. Sheep fatten astonishingly when fed upon it, and all grazing animals eat it with avidity. It keeps green and succulent after the seeds are ripe, even until the heavy frosts of winter. It loses less weight in drying than any other species. It is objected in some quarters that it is very difficult to exterminate from the soil, and probably in some cases the objection is well founded; but we have had no difficulty in raising good corn from its sod with the free use of the cultivator. Professor Buckman says that it grows abundantly on the great oolite limestone soils of England, and is there called squitch grass. It is difficult to kill it there; but he says the most effective plan is to sow the ground with white mustard on the stubble, and when it is eaten off by the sheep, apply a dressing of farm yard manure, and plow it up for a winter fallow, and sow turnips the following year. We have no analysis of this grass by English, German or American chemists, which is very greatly to be regretted. The Woburn experiments give the following results: The produce per acre, when in flower, is 3,403 pounds, which loses 1,956 pounds by drying (we have never tried the experiment, but are confident there would be much less loss here), which yielded 265

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pounds of nutritive matter. At the time of ripening the seeds, it gave 4,093 pounds to the acre, which lost 2,041 pounds in drying, and gave 319 pounds of nutritive matter. Mr. Sinclair describes a variety of this species under the name of *Poa erecta*. We have seen here exactly what he describes, but it does not differ enough from the standard species to separate it under a distinct name. It is simply the form that *P. compressa* assumes upon the soils most favorable to its growth. The results of Mr. Sinclair's experiments upon this form of the grass were much more favorable. The produce per acre, when in flower, was 15,654 pounds, which lost 9,001 pounds in drying, and gave 743 pounds of nutritive matter. When the seed was ripe the grass weighed 14,973 pounds, which lost 6,738 pounds by drying, and gave 1,169 pounds of nutritive matter. The aftermath yielded 4,764, which gave 111 pounds of nutritive matter. The seed is covered with the inner husks without opening. It is oblong, flattened, and tapers to a point at each end. Although this grass is spoken of by most writers on the subject in terms of contempt, we must differ very decidedly from them, and adhere to the opinion, which we have formed after much observation and experience, that it is one of the most valuable and nutritive of them all.

34. ERAGROSTIS.—Name from the Greek *era*, earth; and *agrostis*, in allusion to the procumbent habit of the original species. The spikelets of this genus are from two to seventy flowered, nearly as in *Poa*, except that the lower palea is but three (rarely one) nerved, not webby haired at the base and deciduous; the upper persistent on the entire rachis after the rest of the flower. Culms often branching. Leaves linear, frequently involute, and the ligule or throat of the sheath bearded with long villous hairs. Panicle various.

1. *Eragrostis reptans*.—Spikelets much flattened, from ten to thirty flowered, very short pediceled, the lowest ones growing from the axils of the leaves and sheathed by them, about five sixteenths of an inch long, one-sixteenth inch wide at the base. Glumes unequal, the outer smallest, keeled, acute, chartaceous. Lower palea three-nerved, acuminate, sometimes tipped with a pale purple tinge; inner palea acute, about half the length of the outer. The panicles are contracted, one to two inches long, the spikelets closely clustered, almost capitate, compound. Culms short, smooth-nerved, very much branched. Prostate, creeping. Sheaths strongly-nerved, hairy, often covered with a parasitic fungus like the rust of wheat. Leaves short, one to two inches long, involute, hairy, linear, pointed, and are also often much covered with rust. The plant is

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imperfectly dicœcious. The seeds are very small, obovate, of a light, reddish, brown color. The whole plant is from three to five inches high. Flowers in July and August. It is found on the sandy and gravelly banks of rivers, and is very abundant on the upper waters of the Hudson. It is very beautiful in its appearance, but we are not aware that it is of any agricultural use whatever.

2. *Eragrostis poœoides.*—Spikelets vary somewhat in shape, from ovate to lance linear, from eight to twenty-flowered, leaden colored, from one-quarter to three-quarter inch long. Glumes nearly equal, rough on the keel. Lower palea ovate, rather obtuse, strongly three-nerved; the upper one shorter. Panicle loosely spreading, pyramidal, the lower branches and first divisions thereof hairy in the axils, branches solitary or in pairs. Culm ten to sixteen inches high, geniculate and branching at the base. Sheaths smooth, loose and hairy in the throat. Leaves smooth beneath, somewhat rough above. Flowers in August and September. It emits a peculiar odor when fresh. It is found in sandy fields and cultivated grounds, and along the roadsides. We are not aware that it has any agricultural value. *Var. megastachya.* The spikelet is from ten to fifty-flowered, and grows whitish when old.

3. *Eragrostis pilosa.*—Spikelets five to twelve-flowered (see Fig. 129*a*, enlarged), linear, often purplish or lead colored, about one-quarter inch long, about as long as their pedicels. Glumes hyaline, unequal, the inner one-third longer than the outer, and rough on the keel, without lateral nerves, sharply pointed. Upper palea persistent, somewhat ciliate on the margins. Lower palea (Fig. 129*d* outspread), pretty strongly three-nerved on the lower flowers, obsolete on the upper ones, obtuse, broadly ovate. Panicle oblong, elongated; branches, when in flower, spreading, otherwise, erect; branches capillary, rough, somewhat flexuous, lower one in twos and threes, single in the upper part. Culms slender, branching, decumbent, geniculate, ten to fifteen inches in length. Leaves narrow, flat, two to three inches long, hairy at the base. Sheaths striate, with a tuft of long, white hairs at the throat. Flowers in August and September. Sandy soils in dry and wet places, abundant around New York and southward. Of no known use as an agricultural grass. Fig. 129*c* magnified flower opened; Fig. 129*b*, a spikelet in which the glumes and all the six lower flowers except the upper paleæ have fallen away.

4. *Eragrostis Frankii.*—We have never seen this species, nor the two next, and copy the description from Prof. Gray. Much branched, diffuse, three to eight inches high; panicle oblong ovate, rather dense,

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spreading; spikelets from two to five-flowered, from one to one and one-half lines long on slender pedicels; glumes very acute; lower palea ovate, acute, rather obscurely three-nerved, joints of the culm mostly reddish. Flowers in August. Low or sandy ground, Ohio to Illinois, opposite St. Louis and south-westward.

5. *Eragrostis Purshii.*—Sparingly branched at the decumbent base, then erect, six to twenty-four inches high; panicle elongated, the branches widely spreading, very loose. Spikelets five to eighteen-flowered, oblong lanceolate, becoming linear, two to four and one-half lines long, mostly much shorter than their capillary pedicels. Glumes and lower palea ovate and acute, or the latter acutish, three-nerved. Sandy or sterile open grounds, New Jersey to Virginia and southward.

6. *Eragrostis tenuis.*—Panicle virgately elongated, one to two and one-half feet long, very loose, the spreading branches bearded in some of the lower axils, their remote divisions and long diverging pedicels capillary. Spikelets two to six, sometimes seven to twelve-flowered, pale or greenish. Glumes lanceolate or awl shaped, very acute, one and one-half to two lines long, membranaceous, as are the oblong lanceolate acute flowers. Lower palea distinctly three-nerved, the upper ciliate scarious. Leaves rather rigid, one and one-half to two feet long, glabrous or sparingly hairy; the sheaths hairy or glabrous; the throat strongly bearded. Flowers one and a half lines long. Annual. Flowers in August and October. Sandy soil, Illinois, Virginia and southward.

7. *Eragrostis capillaris.*—Spikelets on long capillary pedicels, about three-flowered, about one-sixteenth inch long, terete, flattened, green, sometimes tinged with purple. Glumes nearly equal, ovate, acute, sharp pointed, hyaline; none of the specimens before us show any roughness on the keels. Lower palea ovate, sharp pointed, longer than the upper. Panicle eight to twelve inches long, the branches in twos and threes semi-verticillate, the secondary branches capillary, flexuous spreading, much divided, naked at the axils, the branches spring out within about two inches of the root. Culm (including the panicle) ten to fifteen inches high, the culms often in large tufts having two or three short root leaves and bearing three or four leaves, five or six inches long, above. Sheaths reddish, bearing a tuft of long hairs at their summits, striated, the margins also hairy. Seeds reddish brown, small, ovoid, somewhat truncated at both ends. Flowers in August. Sandy fields and dry soil generally. Very delicate and pretty, but useless agriculturally.

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8. *Eragrostis pectinacea.*—Spikelets flat, oblong, from five to fifteen-flowered, frequently elongated and linear, generally purplish, but sometimes green, closely flowered. Panicle large, very much branched, ten to fifteen inches long, the main branches rigid and divergent, with tufts of hair in their axils. Glumes oblong-ovate, acute, nearly equal, rough on the keel. Lower palea oblong-ovate, acute, strongly three-nerved, roughish; the upper one hirsute-ciliate on the double keel. Culm annual, one to two feet high, growing in tufts, somewhat rigid. Lower sheath hairy, bearded in the throat. Leaves longer than the culm, two to three lines wide, with long hairs on their lower extremities. Seed oblong, reddish brown. Flowers in August and September.

Variety *spectabilis.*—Leaves and sheaths mostly glabrous; the branches of the panicle and the pedicels shorter; the lower branches become reflexed as they grow older. Flowers in August and September. It is found along the coast on sandy fields from Massachusetts southward. It is common on Long Island, and very common in New Jersey.

All the members of this species are very elegant and graceful, and are easily recognized by the sharpness with which each flower is defined in the spikelet. Its minute seeds furnish food for the smaller birds that in their turn devour the larvæ of many insects which would otherwise destroy the crops of the farmer. The members of the genus *eragrostis* aid him indirectly, but if any member of it has any direct agricultural value, we have never been able to discover it. No analysis has ever been made of any of them, nor has their value been tested by feeding.

35. BRIZA.—Quaking grass. Name from the Greek *brizo*, to slumber, or *britho*, to bend downward, in allusion to its pendant branches. The spikelets in this genus are many-flowered, ovate or heart-shaped, flattish-tumid, the flowers closely imbricated. Glumes roundish, unequal (purple). Lower palea roundish and entire, flattened parallel with the glumes, ventricose on the back, heart-shaped at the base, papery-membranaceous and, becoming dry, scarious margined, obscurely many-nerved; the upper palea very much smaller, ovate, flat. Stamens three. Stigmas branched, plumose. Grain flattened parallel with the paleæ, adhering to the upper one. Leaves flat. Panicle loose, diffuse, with the large and showy spikelets often drooping on delicate pedicels.

1. *Briza media.*—Spikelets broadly ovate, with from five to nine flowers, tumid, sometimes variegated with purple, brown and white,

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depending from long, capillary flexuous pedicels. Glumes (Fig. 130) broadly obtuse, nearly equal with two lateral ribs. Paleæ (Fig. 131) as described in the definition of the genus, to which we may add that the inner palea has two green marginal nerves delicately fringed on the upper part. The panicle is loose, pyramidal; the branches arranged in pairs alternately on the smooth rachis somewhat remote from each other. Culm erect, slender, bearing generally four leaves upon smooth sheaths; the upper sheath longer than its leaf with a short, obtuse ligule. The whole plant is from ten to fifteen inches high. The leaves are flat, roughish on the inner surface. The root is perennial, fibrous, tufted. Cattle eat it, but it is so slender that its very small bulk and the extreme tenacity of its culms and leaves make it very poor pasture grass. It is only suited to the poorest soils. Rich ground or manure drives it out quickly by encouraging the growth of grasses that smother it. It flowers in June. Its highest limit of altitude is 1,500 feet above the sea. It is pretty widely distributed, growing spontaneously in England, Scotland, Ireland, Norway, Sweden, Prussia, Germany, France, Spain and Portugal, Greece, Russia and the United States, though it is not frequently met with here, but is occasionally found in the pastures of New England and Pennsylvania. Mr. Sinclair gives the weight of this grass on an acre as 9,528 pounds, when in flower, which lost 6,431 pounds on drying, and gave 409 pounds of nutritive matter. When the seed was ripe the produce was 9,528 pounds, which gave 483 pounds of nutritive matter. The aftermath on an acre weighed 8,167 pounds, with 255 pounds of nutritive matter. A poor, sandy soil gave 10,890 pounds, with 453 pounds of nutritive matter; a moist, clayey soil gave 8,167 pounds, with 293 pounds of nutritive matter; a rich, black loam gave 9,689 pounds, with 462 pounds of nutritive matter. It will be seen, from the above, that a dry, sandy soil gives a greater produce and a greater relative amount of nutriment than any other. As half a loaf is better than no bread, it may be better for the farmer to sow these seeds on such land rather than leave it without any grass whatever. The seeds weigh from ten to twelve pounds to the bushel. Fig. 130 shows the glumes; Fig. 131, the paleæ; Fig. 131*a*, the floral organs; Fig. 132, *Briza media.*

Briza maxima, a very handsome plant, is often seen cultivated in gardens, and some of it may have escaped into the fields.

36. Festuca.—Fescue grass. The name is said to be derived from the Celtic word *fest*, signifying food or pasturage. Spikelets three

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to many-flowered, panicled or racemose, the flowers not webby at the base. Glumes unequal, mostly keeled. Paleæ chartaceous or almost coriaceous, roundish (not keeled) on the back, more or less three-nerved, acute, pointed or often bristle-awned, rarely blunt, the upper mostly adhering at maturity to the inclosed grain. Stamens, mostly three. Flowers, and often the leaves, rather dry and harsh.

1. *Festuca tenella.*—Spikelets much flattened, seven to eleven-flowered, brownish when old, terminating acutely, five-sixteenths of an inch long. Glumes unequal, linear, the inner one longest, three-ribbed, subulate. Lower palea (including the awn) three-sixteenths of an inch long, the awn about one-third the length of the palea, not keeled, narrow, subulate, the upper part rough (under a lens), involute; the upper palea shorter, acuminate; seed linear with a groove on the upper side. Panicle one to three inches long, generally about two inches, spike-formed, the branches very short, a single spikelet on each, alternate. Culm six to twelve inches, slender, geniculate at the base, one to three inches long, filiform, erect, involute. Flowers in June and July. Fig. 133, a magnified spikelet; Fig. 134, *Festuca tenella.*

2. *Festuca ovina.*—Spikelets flattened, four-sixteenths to five-sixteenths of an inch long, two to six-flowered, flowers remote. Glumes unequal, the uppermost three-ribbed, keeled, acute, chartaceous, the lower one without lateral ribs, linear. Lower palea lanceolate, terminating in a rough awn about one-sixth of the length of the palea, the upper one bifid with two green marginal ribs, which are minutely ciliate on the upper half. The lower flower shows five nerves when examined with a strong lens in good light. Panicle narrow, the lower branches in pairs, the rest mostly unilateral and shorter, the branches angular, rough, the rachis rough above the lower branches. Culms erect, eight to eighteen inches high, form dense rooted tufts, bearing two or three filiform leaves; root leaves from two to ten inches long, four to six in number, the upper leaf much shorter than its sheath. Leaves involute, somewhat roughish on the external surface, three-nerved and hairy within. Root perennial, fibrous. Flowers in June and July. Is found from New England to Lake Superior and northward. Fig. 135, glumes; Fig. 136, paleæ; Fig. 137, *Festuca ovina.* Variety *vivipara*, having running root stocks with the spikelets partially converted into leafy shoots, is found on the summits of the White mountains of New Hampshire and mountains northward. Fig. 138, the glumes; Fig. 138*a* is a representation of this transformation of the palea taken from Dr. Parnell's work on grasses, the

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shoot much larger than any one we have seen in this country. Fig. 138*b* is the whole plant.

Festuca ovina is distinguished from *F. tenella* by its one-sided panicle, by its flowers being more remote in the spikelet and being more tumid, by its shorter awn, and by its ligule, which is higher on one side than the other. It forms the great bulk of the sheep pastures of the Highlands of Scotland, where it is the favorite food of the sheep, and where the shepherds believe it to be more nutritious for their flocks than any other. Gmelin says that the Tartars choose to encamp during the summer where this grass is most abundant, because they believe that it affords the most wholesome food for all cattle, but especially for sheep. Linnæus asserts that sheep have no relish for hills and heaths that are destitute of it. Nature distributes it among dry, sandy and rocky soils, where scarcely any other species would grow, and thus indicates its place in vegetable economy. It is without doubt the very best of the grasses growing on sandy soils. It roots deeply and forms a dense, short turf, which adapts it admirably for lawns, bowling greens and pleasure grounds where the soil is sandy. It requires little mowing, resists the intrusion of most weeds, and retains its verdure in open situations through the summer, even in seasons where long continued drought destroys most other vegetation. It is almost useless for a hay crop, as its leaves and culms are too fine to give a remunerative amount of hay; it is only as a pasture grass on sandy soils that it is valuable; and in these, when highly manured, it is driven out by the more succulent species. Its seeds weigh about fourteen pounds to the bushel. It is often found 4,000 feet above the level of the sea. Chemical analysis does not confirm the opinion of shepherds that it possesses great nutritive properties; though the shepherds are, after all, quite as likely to be right as the chemists. At the grass garden at Woburn, on a light sandy soil, it produced at the time of flowering at the rate of 5,445 pounds to the acre, which yielded 212 pounds of nutritive extract. At the ripening of the seeds the produce was 5,445 pounds, which gave 127 pounds of nutritive matter. The aftermath yielded 3,403 pounds of hay which left 66 pounds of nutritive extract. When cultivated on a heath soil, the produce was less. There is another variety of this grass.

Var. duriuscula. — Spikelets four to eight-flowered, erect, oblong, terete, arranged on the branches and rachis alternately; glumes and paleæ like those of *F. ovina;* panicle open, compound, two to three inches long, the upper part racemed, the lower branched. Its limit of altitude is 3,000 feet above the level of the sea. Flowers

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in June, and is found in dry pastures eastward. We have an analysis of this variety by Mr. Way, which gives water 69.33, nitrogenous matters or protein 3.70, fat 1.02, heat-producing principles 12.46, woody fibre 11.83, ash 1.66. According to Mr. Sinclair's experiments, an acre of clayey loam with manure produces 18,376 pounds of grass, which loses in drying 10,106 pounds, and affords 1,004 pounds of nutritive extract. When the seed is ripe the produce is 19,057 pounds, which loses 10,481 pounds in drying, and yields 446 pounds of nutritive extract. The produce of the aftermath was 10,209 pounds, which yielded 199 pounds of extract. From these results it would seem that this variety is much more valuable than any of the narrow-leaved fescues, and the conclusion seems to harmonize very well with practical experience. The seeds weigh about ten pounds to the bushel. Linnæus describes this as an independent species; it varies greatly in its forms, and English authors divide it into a long list of varieties; but probably nothing is gained by this, either to pure science or agricultural practice. The only practical distinction between the fescues is into the broad and narrow leaved kinds; *Festuca ovina* being the type of the narrow-leaved, which, in their natural situations, occupy sandy lands, and the broad-leaved varieties, growing in richer lands, of which *F. elatior* is the type. Professor Buckman, of the Royal Agricultural College of Cirencester, sowed the seeds of three of the narrow-leaved forms, viz.: *F. ovina*, *F. rubra* and *F. duriuscula* in experimental plots, which came up well, presenting the peculiar tufted form so characteristic of the genus when standing alone. For two years the specific differences were tolerably marked, but on the third they vanished, and the appearance of all three was just about alike, the creeping habit of *F. rubra* being entirely lost. It assumes the form of *F. ovina* in poor upland regions, of *F. duriuscula* in good uplands, and *F. rubra* by the sea side.

He in like manner sowed three of the smooth-leaved varieties in separate plots. In the first year *F. loliacea* grew with the true spicate type, but a few paniculate flowers manifested themselves. *F. pratensis* and *F. elatior* could be hardly distinguished from each other. At the end of three years all the spicate flowers had disappeared and there were hardly any differences observable in the three plots; at the end of six years all the varieties presented the appearance of *F. elatior*. As this seems the most perfect type of the grass, its name should cover all the above enumerated species. These experiments of Prof. Buckman, extending over a period of several years, give practical results of great value; and it is greatly to be desired that

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they may stimulate our enterprising farmers to make similar investigations, until every genus of the Gramineæ has been subjected to the same course of investigation. It seems to be a well authenticated fact that hares will gnaw *F. duriuscula* to the ground before they will touch *F. pratensis* or *F. ovina.*

3. *Festuca elatior.*—Spikelets ovate lanceolate, with from four to eight flowers, fusiform before the emergence of the stamens, tinged with red and white, afterward flattened and the flowers appear remote, about one-half an inch long. Glumes unequal, the inner one, being the largest, is obscurely three-nerved, and roughish on the upper part of the central one; the outer one without lateral nerves, linear-lanceolate. The outer palea of the lowermost floret longer than the glumes, lanceolate, roughish to the touch, membranous at the summit, often bifid, mucronate, sometimes with a short rough awn terminating the central rib; the inner one about as long as the outer, with two green marginal ribs, minutely fringed. Panicle contracted before and after flowering, loose and spreading when in flower, and inclining on one side; the lower branches simple and compound, the upper spikelets arising directly from the rachis on short footstalks. Culms from two to four feet high; leaves broad, flat, rough on the inner surface, about a foot long; sheaths smooth, loose; ligule short, embracing the stem more on one side than another; root perennial, fibrous, somewhat creeping, cespitose; seed oblong, oval. Fig. 139, glumes; Fig. 140, paleæ; Fig. 141, *Festuca elatior.* We have rarely known the seeds of fescue to be sown in this country, and have never seen a field of pure fescue grass; but *F. elatior*, or that modification of it which is known as *F. pratensis*, and which differs from it only in being shorter and less branched, is found in greater or less abundance in almost every northern State, both in meadows and pastures. Cattle are very fond of it both green and in the form of hay. It flowers in June, and when left until the timothy is ripe, much of its value is lost. It succeeds best in moist low lands, though it is sometimes found in pretty dry lands. It does not appear more than 800 or 900 feet above the level of the sea. Its seeds weigh fourteen pounds to the bushel. Messrs. Scheven and Ritthausen found it to contain 74.8 of water; 2.4 of albuminous matters; 0.8 of fat; 10.2 of heat forming principles; 10.1 of woody fibre, and 1.7 of ash. The Woburn experiments give 54,450 pounds of this grass at the time of flowering, which lost 30,628 pounds in drying, and gave 4,253 pounds of nutritive matter.

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4. *Festuca nutans.*—Nodding fescue grass. Spikelets about one-fourth inch long, three to five-flowered, mostly three-flowered, depending from the extremities of the long branches, ovate; upper glume three-nerved, serrulate on the keel, lanceolate, acuminate; paleæ coriaceous, nearly equal, ovate oblong, somewhat obtuse, smooth, awnless, very obscurely five-nerved, not scarious on the margin, quite close together; the upper palea strongly margined, lanceolate; panicle of long nodding branches, very slender, rough, especially when old, bearing a few spikelets on their extremities; branches mostly in pairs; culms two to four feet high, erect, simple; leaves two to three lines wide, taper-pointed, often a little hairy; ligule short; perennial. Flowers in June. It is rarely found in meadows or in pastures, but is often seen in rocky woods and shady banks. We know very little of its value for hay or pasture, but it is one of the most beautiful of the grasses; its long drooping branches and the dark glossy green of its leaves, contrast beautifully with the light green of its spikelets. Fig. 142, lower palea; Fig. 143, upper palea; Fig. 144, *Festuca nutans.* It is quite possible that some new members of this family may yet be introduced into this country from abroad. Mr. Hooker, in his botany of the antarctic voyage, mentions *F. foliosa*, a grass of large growth and very leafy, affording a rich and nutritious food for animals, similar to the tussac grass found in Campbell and the Auckland islands. *F. Cookii*, "the commonest grass of Kerguelen's land, latitude 50° S., and a very valuble one, affording a rich and abundant fodder, also allied to the tussac grass." *F. purpurea*, "a tall, handsome species, somewhat resembling *F. elatior.*" Found over the Straits of Magellan, Port Famine, Fugia and Goodsuccess Bay.

37. BROMUS.—Brome grass. An ancient Greek name for a species of wild oat *bromos.* Broma, food. The spikelets of this genus are five to many-flowered, panicled; glumes unequal, membranaceous, the lower one to five, the upper three to nine-nerved; lower palea either convex on the back, or compressed, keeled, five to nine-nerved, awned or bristle-pointed from below the mostly two-cleft tip; upper palea at length adhering to the groove of the oblong or linear grain; stamens three; styles attached below the apex of the ovary. Coarse grasses with large spikelets at length drooping, on pedicels thickened at the apex. Mr. Babington distinguishes this genus from *Festuca* by the sheath which, in that genus, is slit to the base, while in *Bromus* it is slit only half way down.

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1. *Bromus secalinus.*—Cheat or chess. Spikelets oblong-ovate, compressed, of eight to ten somewhat distant flowers, smooth, turgid; glumes (Fig. 144*a*, enlarged) ovate-lanceolate, the lower one five-nerved, the upper seven-nerved; lower palea (Fig. 144*c*, enlarged) obscurely seven-nerved, *pubescent* (*i. e.*, covered with fine, soft hairs or down), a little longer than the upper one, the awn is short and is sometimes wanting; inner palea (Fig. 144*b*) linear-oblong, furnished with two green marginal nerves fringed with white hairs; panicle spreading, and, when in seed, drooping, four to six inches long; the branches semi-verticillate, the lower ones arising from the rachis mostly in threes, mostly simple, very little branched; culm two to three feet high, bearing four or five leaves with striated sheaths; nodes pubescent and swollen; the upper sheath is surmounted with an oblong and ragged ligule, smooth; the lower sheaths often hairy; leaves broadly-linear, sharp-pointed, flat, soft, downy or hairy on the upper surface, the margins rough to the touch. Flowers in June. It is mostly found in wheat and rye fields, but not unfrequently large patches of it will be found in meadows and pastures. Annual. It is very difficult to distinguish between *B. secalinus* and the other species embraced in the sub genus *Eubromus;* but we think all doubts can be easily settled by the application of a rule which was, we believe, first suggested by Dr. Parnell, and which we have never found to be unreliable since we first began to apply it. The rule is that in *B. secalinus* the apex of the large glume is midway between its base and the summit of the *second* floret on the same side (see Fig. 144*d*). In *B. racemosus* and *B. mollis* it is midway between the base and the summit of the third floret. For a view of the whole plant see Fig. 144*e*.

Mr. Flint gives us a very interesting account of a fraud which an unblushing speculator attempted to perpetrate upon the agricultural community, and of a most excellent experiment which was made to test its value, which we cannot do better than copy entire from his pages. "Nothing more clearly illustrates the want of accurate knowledge of subjects intimately connected with agriculture, and immediately affecting the farmers' interests, than the history of the introduction and propagation of this worthless pest to our grain fields. It has been heralded in the papers in connection with the names of distinguished friends of agriculture, with the earnest hope that it might receive extended trials. Monstrous prices have been charged and paid by the unsuspecting farmer for its seed, in many cases four and five dollars a bushel, a pledge being exacted that it should not

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be allowed to go to seed, for a reason which will shortly appear. Committees of agricultural societies have been invited to examine and report upon it; and in a letter now lying before me, the disinterested propagator very kindly offers to put up ten barrels of bromus seed for $100, saying, that of course the earliest applicant will be sure of obtaining till all is gone, which would scarcely give a barrel to a state. * * * * Years must elapse before the country can be supplied as it now is with Herd's grass and clover seed. My offer invites coöperation and participation in the profits and pleasures now available," for taking advantage of the honest credulity of the public?

"A quantity of bromus seed was sent to the State farm for the purpose of experiment, with a letter with directions to sow with clover in the spring of 1855. The crop was cut while yet green, and before the grass had developed sufficiently to distinguish it with certainty. This present year (1856) directions were given to let it stand later in the season. While engaged in the collection and study of specimens in the course of the summer, I gathered samples of this grass when it was still immature. Without giving it a very close examination at the time, I pronounced it the *Bromus arvensis*, which at that stage of its growth it very much resembles. A few days after I was astonished to see it develop into chess (*Bromus secalinus*) This was the first ripe specimen of Willard's bromus I had seen. I examined it with care with a strong magnifying glass, and to avoid the possibility of a mistake, I submitted a few specimens of it to Prof. Gray, of Cambridge, and to Prof. Dewey, of Rochester, New York, both of whom, after examination, pronounced it genuine chess.

"But Mr. Willard having quoted from the report of a committee of an agricultural society in which it was said that if a 'jury of cows should confirm the opinion of Mr. Willard, as to the superiority of the grass, then will the agricultural community owe him a debt of gratitude for having introduced to notice here a species of grass which is highly beneficial on light sandy soils, much superior to any other species, and producing most abundantly on land of better quality,' I very recently directed the grass to be submitted to such a jury, impanneled and kept under the charge of Mr. L. P. Chamberlain, at the State farm, which unhesitatingly pronounced a verdict in accordance with the facts, which were as follows:

"The grass which was first submitted for comparison with the bromus was the reed canary grass (*Phalaris arundinacea*), a grass of very slight nutritive and palatable qualities, as will appear by reference on a subsequent page to the careful analysis made of it at my

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request, by Prof. E. N. Horsford, of the Lawrence Scientific School, Cambridge. The English hay used was such as commonly goes by the name among farmers, made up of timothy and red-top, mainly of fair quality. The meadow or swale hay was taken from a wet meadow, made up of coarse swale grasses, such as are common in eastern Massachusetts, and pass under the term of "meadow hay." The bromus was carefully picked out from all other grasses. The two kinds given in each trial were put into the same crib, but separated by a partition.

First trial.—Bromus and reed canary grass. There was no choice. Both were eaten alike till they were gone.

Second.—Bromus and English hay; preferred English hay.

Third.—Bromus and swale hay; preferred swale.

Fourth.—Bromus and oat straw; preferred bromus.

Fifth.—Canary grass and English hay; preferred English hay.

Sixth.—Canary grass and swale; preferred swale at once.

Seventh.—Canary grass and oat straw; preferred oat straw.

Eighth.—Canary grass and cornstalks; preferred cornstalks.

Ninth.—Bromus and cornstalks; ate alike of each till both were gone.

Tenth.—Bromus and millet; chose the millet and did not touch the bromus.

"This is a true transcript of the verdict of that intelligent jury, and it is precisely what I should have anticipated, from what I knew of the grasses. The trial by jury should be final." This is, indeed, a most valuable piece of investigation which we hope will be followed up by intelligent farmers all over the country until it is fully and satisfactorily ascertained which of the grasses growing in our meadows and pastures are the most palatable and the most nutritious. *Bromus secalinus* is universally regarded as a pest in the grain field. Mr. C. Johnson, says: "Not only does the abundant production of the large seeds of *bromus secalinus* tend greatly to exhaust the soil, but, where present in any quantity, they much deteriorate the value of the grain by ripening about the same time, and thus becoming mingled with it when threshed. The occasional bitterness of both wheat and rye flour is generally due to such admixture; and the bread made from it is not only unpalatable but unwholesome, as the seeds of this and the other brome grasses of the section have a narcotic quality approaching to that of the darnel. This effect has been long known in Sweden, in the southern provinces of which it is so common among the rye, that it was supposed to be a degenerate form of that

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grain, an idea that still prevails among the uneducated country people in some parts of England. The panicles are employed in Sweden for dyeing green." We have no analysis of this grass whatever; it was once as great a nuisance in England as it is with us, but in consequence of the unremitting warfare which has been made upon it by the British farmers, it is now so rare there that it is difficult to procure even specimens for an herbarium.

2. *Bromus racemosus.*—Upright chess. Spikelets much as in the preceding, except that the apex of the large glume is half-way between its base and the summit of the *third* floret. The lower palea bears an awn of about its own length. Panicle erect, simple, contracted in fruit. Chiefly found in grainfields, not unfrequent, but generally mistaken for the preceding. Fig. 145, spikelet showing the two glumes and ten florets. Fig. 146, the two glumes. Fig. 147, floret showing the outer and inner paleæ. Fig. 148, outer palea, showing the seven ribs. Fig. 149, inner palea fringed. Fig. 150, ligule. Fig. 151, *Bromus racemosus.* Fig. 151*a*, ovary, squamulæ and reproductive organs.

3. *Bromus mollis.*—Spikelet erect, ovate, compressed, consists of eight or ten awned florets imbricated over one another. Glumes nearly equal, hairy, membranous at the margins. Upper glume seven-nerved, lower glume five-nerved. Lower palea acute, rather longer than the glume (*i. e.* the lowest flower in the spikelet) hairy, soft to the touch, membranous on the margin and generally bifid at the apex, seven-nerved, the dorsal rib terminates in an awn roughish but not quite its own length. The inner palea linear-oblong. Panicle simple or racemed, erect, narrow, contracted in fruit. The lower branches arise from the rachis mostly in threes, rough, hairy, culm erect, pubescent, the hairs mostly point downward. Upper sheath surmounted with a short, obtuse, jagged ligule; sheaths pubescent. Leaves flat, pubescent on both surfaces, rough at the edges and points. Root annual, fibrous. Flowers in June. Found in wheat fields and sandy banks of streams, not common. It is distinguished from *B. racemosus* by the hairyness of the glumes and florets, whereas in *B. racemosus* the glumes and florets are rough but not hairy. Its limit of altitude is found about 1000 feet above the level of the sea. Small birds are very fond of its seeds which are large, ripen early, and weigh from thirty to thirty-five pounds to the bushel, which is more than light oats. Most farmers think this grass an intolerable nuisance, but there are others, though as yet they form a small minority, who think it more valuable than an oat crop. We are inclined to believe that the

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question of its value is worthy of being settled by more accurate experiments than have ever yet been made, and it is to be hoped that chemists and practical farmers will make them without delay. It has been analyzed by Scheven and Ritthausen, and by Way. According to the former, it contains 66.8 of water, 2.8 of flesh forming albuminous matters, 0.5 of fatty matters, 12.7 heat producing matters, 14.5 woody fibre and 2.7 of ash. According to Mr. Way, 76.62 of water, 4.05 of flesh forming albuminous matters, 0.47 of fatty matters, 9.04 heat producing principles, 8.46 of woody fibre and 1.36 of ash. These wide discrepancies which cannot be attributed to carelessness or want of skill, seems to point to very strong influences of soil, climate and culture on the tissues of the plant which may lead to very important practical results if perseveringly followed up.

The results of the Woburn experiments were as follows: The production per acre, from a sandy loam was, at the time of flowering, 10,890 pounds, which lost in drying 5,445 pounds, and afforded 510 pounds of nutritive matter. When the seed was ripe, the produce was 2,722 pounds, which lost 681 pounds in drying, and afforded thirty-one pounds of nutritive matter. It will be observed that the grass at Woburn lost 1,827 pounds more in the drying than the German grass, and 2,895 pounds more than the grass upon which Mr. Way's experiment was made. If we assume that all the matters found by the German and English chemists were nutritive, we have 3,618 pounds of these matters in the former, and 2,550 pounds in the latter, in 10,890 pounds of grass, the first being 3,108 pounds more, and the latter being 2,550 pounds more than Mr. Sinclair found. Or, if we deduct the woody fibre from their analyses, the German analysis gives 2,038 pounds of nutritive matter; and Mr. Way's analysis gives 1,624 pounds of nutritive matter in 10,890 pounds of grass. In this latter case the German experiments give 1,528 pounds, and Mr. Way's experiments give 1,114 pounds more nutritive matter than the Woburn experiments. The German gives 414 pounds more of nutritive matter than the English; but Mr. Way gives nearly twice as much of the more valuable flesh forming principles than the German. Fig. 152, glumes enlarged. Fig. 153, paleæ enlarged. Fig. 154, *Bromus mollis.* Fig. 154*a*, spikelet. Fig. 154*b*, reproductive organs.

4. *Bromus Kalmii.*—Wild chess. Spikelets three-fourths of an inch long and three-sixteenths to one-fourth of an inch wide, compressed, closely five to nine-flowered, set on the extremities of the drooping capillary branches; glumes unequal, lanceolate, but not

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mucronate; hairy, especially on the central rib; the inner glume five-nerved, the outer three-nerved; lower palea oblong-lanceolate, seven-nerved, which are obscured by the long silky hairs, terminated by an awn about one-third of its length; the upper palea much smaller; panicle about three inches long, simple, the branches in twos or threes, rough; culm one and a half to two and a half feet high, slender, hairy at the nodes; lower sheaths retrorsely (*i. e.* bending downwards) hairy; ligule very short, truncated, sometimes almost wanting; leaves about one-quarter of an inch wide near the base, hairy on both sides, but less so on the lower one, rough on the edges, especially when rubbed downward. Perennial, indigenous. Flowers in June and July. It resembles the next very much, but differs from it in its small contracted panicle, very hairy flowers and shorter awns. It is found on dry woodlands, and river banks, and sometimes in open places, almost everywhere at the northward.

5. *Bromus ciliatus.*—Spikelets half to one inch long, flattened, margins covered thinly with hairs, which are closely appressed, seven to ten-flowered; glumes unequal, the outer smaller, one-nerved, linear, acute, pointed; the inner three-nerved, rough on the central nerve, pointed; lower palea rounded on the back below but keeled on the upper part, coriaceous, tipped with an awn about half its length, half an inch long exclusive of the awn; inner palea shorter, linear, chartaceous, with green marginal nerves with a short fringe of hairs, pointed; panicle six to ten inches long, compound, very loose, branches in fives and threes, rough, after flowering quite open and nodding; culm three to four feet high; joints black and covered with minute hairs; sheaths striate, slightly roughish, the upper one shorter than its leaf; ligule short, truncate, lacerate, coriaceous; leaves broadly linear, three to seven lines wide, seven to fifteen inches long, smoothish beneath, hairy above, varies greatly with respect to pubescence. Perennial, indigenous. Flowers in July and August, quite common on river banks and moist woodlands.

6. *Bromus sterilis.*—Spikelets long and lanceolate, with from six to eight florets, oblong when old and the flowers remote; glumes unequal (Fig. 154*c* enlarged), lanceolate, subulate, tapering to a sharp point, the upper one with three rough ribs minutely toothed on the upper half; outer palea, Fig. 154*d*, seven-nerved, margins membranous and bifid at the summit, the dorsal rib rough and longer than the palea, and passes behind the bifid summit; awn about one inch long; inner palea linear and nearly one-third shorter than the outer one, with a ciliate margin; panicle very loose; the branches are long

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and nearly simple, the branches emerge in threes and twos, and are rough, arising from the sharply triangular rachis; culm one to two feet high, striated, smooth. Sheaths slightly pubescent, the upper sheath about equal in length to its leaf. Ligule obscure, ragged. Root annual, creeping; seeds linear, with a deep groove on the upper side, and weigh from thirty to thirty-five pounds to the bushel. Leaves two to three lines wide, flat, linear, pubescent, and with a few long white hairs at the base. Flowers in July. Mr. Sinclair's experiments embrace what he calls *Bromus sterilis*, and his description agrees well enough with our grass, except that he says the awn is twice the length of the palea. His grass gave 29,947 pounds to the acre at flowering time on a sandy soil, which lost 13,102 pounds in drying, and gave 2,339 pounds of nutritive matter. Mr. Sinclair says that "when the seed is perfected, the nutritive matters contained in the culms and leaves are comparatively nothing. The long sharp awns with which the spikelets are armed, must prevent cattle from eating it. It grows chiefly under hedges, and on banks by the road sides, where it is very common; but it is seldom found beyond the reach of the shade. I never could observe that any of it had been touched by cattle." It is found chiefly in this country on river banks in New England, New York, and Pennsylvania, but is rather rare. It is represented in Fig. 154*e*.

38. UNIOLA.—Spike Grass. Spikelets closely many flowered, very flat and two edged; one or more of the lowest flowers sterile (neutral), and consisting of a single palea. Glumes lanceolate, compressed-keeled. Lower palea coriaceo-membranaceous, strongly laterally compressed and keeled, striate nerved, usually acute or pointed, entire, inclosing the much smaller, compressed, two-keeled upper one and the free laterally flattened smooth grain. Stamen 1 (or in *U. paniculata* 3); upright, smooth perennials growing in tufts from strong creeping root stocks, with broad leaves and large spikelets in an open or spiked panicle.

1. *Uniola paniculata.*—Spikelets said to be sometimes two inches long, but we have never seen any over an inch. The most usual size, as far as we have been able to see, is from one-half to three-quarter inch, roundish-ovate, very much compressed, yellowish when dry, sharp edged. The three lower flowers neutral, having but a single palea, nine to fifteen-flowered. Glumes about equal, but in many flowers the inner is somewhat shorter, acute, subulate, keeled, membranaceo-chartaceous, the outer three-nerved, the inner five-nerved, one pair indistinct. Paleæ about equal, the outer eleven-nerved at the

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upper part, keeled, minutely toothed on the keel, glabrous, bluntish, hyaline margins, smooth. Inner palea linear, slightly hairy at the base, three-nerved, the marginal nerves within the hyaline border. Panicle one to two feet long, drooping on one side, open, simple. Branches smooth, semi-verticillate in threes and fives, spikelets short pediceled, about one-eighth inch long. Culm from four to eight feet high, including the panicle; perennial; root creeping. Grows on sand hills on the sea shore from Virginia southward; abundant in Florida and Bermuda. We have no reliable information respecting its qualities as a hay or pasture grass. Leaves narrow, when dry convolute.

2. *Uniola latifolia.*—This differs mainly from the foregoing in its long pedicels and in being ciliate on the keel, and in its broad, flat leaves, which are from three-quarters to one inch wide. Culm two to four feet high. Flowers in August. It is said to grow in Pennsylvania, but we have never seen it north of Newcastle, in Delaware. Fig. 154*f*, spikelet of *U. latifolia*, about natural size. Fig. 154*g*, a flower enlarged. Fig. 154*h*, empty lower palea of the lowest (sterile) flower.

3. *Uniola gracilis.*—The appearance of the spikelets is unique, four to six flowered, $\frac{3}{16}$ to $\frac{5}{16}$ inch long, very short pediceled, almost sessile, acute at the base, spreading out rapidly into the form of a wedge. Glumes small, unequal, the outer shorter, blunt pointed, subulate, herbaceous; the inner glume seven-nerved, the outer one five-nerved. Lower palea broad at the base, with scarious margins curving rapidly inward to form a long divergent beak, nine-nerved, herbaceous, ciliolate. Panicle twelve to eighteen inches long, contracted, virgate, the single branches closely appressed, flowered to the base. Culm cespitose, two and a half to four feet long, slender, bearing about five leaves, sheaths clothed with long white hairs. Ligule almost obsolete, with a thick tuft of long hairs. Upper leaf much longer than its sheath. Leaves $\frac{3}{16}$ to $\frac{5}{16}$ inch wide, and from six to fourteen inches long. Flowers in August. Found in sandy soil, from Long Island to Virginia, near the coast and southward. Stamen single; anthers dark purple. Grain rugose, dark brown.

39. PHRAGMITES.—Reed grass. From the Greek *phragmites*, growing in hedges, which this aquatic grass does not. Spikelets three to seven flowered, the flowers rather distant, silky villous at their base, and with a conspicuous silky bearded rachis, all perfect and three-androus except the lowest, which is either neutral or with a single stamen, and naked. Glumes membranaceous, shorter than the flowers, lanceolate, keeled, sharp pointed, very unequal. Paleæ mem-

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branaceous, slender, the lower narrowly awl-shaped, thrice the length of the upper. Squamulæ two, large. Styles long. Grain free. Tall, stout perennials, with numerous broad leaves and a large terminal panicle.

1. *Phragmites communis.*—Spikelets from three to five flowered, from four to seven-sixteenths of an inch long, wedge shaped, pedicels capillary $\frac{3}{16}$ to $\frac{5}{16}$ inch long. Glumes linear, pointed, unequal, the inner longest, the lower part reddish, keeled, three-nerved. Paleæ very unequal, lower palea membranaceous, three-nerved, subulate, the apex drawn out to a very long point, $\frac{4}{16}$ to $\frac{6}{16}$ inch long, giving rise to woolly hairs at the base which are nearly as long as itself, inner palea about one-third of the length of the outer and is minutely fringed on the upper part. Lowest flower usually monandrous, or neuter. Panicle one sided, nine to fifteen inches long, nodding, loose, very much branched. Culms six to twelve feet high, sometimes more than an inch in diameter at the base, mostly one-half an inch, very leafy. Leaves one to two inches wide, and from twelve to twenty inches long, broad lanceolate, many nerved, having three or four smaller nerves between two much more prominent ones, flat, smooth, often split at the summit and divided into capillary points. Flowers late in August. Found on the borders of ponds, swamps, and river banks. It has the appearance of broom corn or sorghum at a distance. Ligule very short, fimbriate. Its culm is usually covered with a very hard silicious covering, which makes it necessary to handle it carefully; we have repeatedly cut our fingers very badly in breaking it; this fact effectually excludes its use as a hay or pasture grass, as it would lacerate the tongues and stomachs of the animals. It is the tallest grass known in the northern States. Mr. C. Johnson, speaking of this grass, calls it "one of nature's most valuable colonists, and is largely concerned in the gradual conversion of swamps and fens, stagnate pools, and other unwholesome spots where water accumulates, into dry land. In some of the low districts of the eastern counties of England, it may be seen entirely overgrowing tracts of considerable extent, called by the inhabitants *reed ponds.* Such tracts, under the improving hand of modern agriculture, are, in a country like ours, yearly disappearing as the drainage progresses, and rich pastures or corn fields replace them; but in lands yet unsubjected to cultivation, or those in which the population is less advanced in the art of farming, the reed itself more slowly fulfills the important change. De Luc, the celebrated geologist of that name in the last century, has well described the process of land formi-

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ation, as it may be termed, in which the grass before us is the pioneer. In Brandenburgh, Brunswick, and other parts of northern Germany, he found at the bottom of every dale, a meadow on a subsoil of peat. Many of these meadows had, within the recollection of the old people of the vicinity, a pool of water in the middle of them; while in others, such pools or lakes existed at the time of his visit, the ultimate filling up of which, seemed to be insured by the causes in action. The sandy sediment, carried into the lake by streams, or during rain, gradually raises its bottom near the shore, thus enabling the common reed, already vegetating on its border, to push forward its creeping stolons farther and farther into the shallow water; it is the leader of the van of progress. Tracing backward from the band of reeds growing in clear water, another band or border extends, consisting of aquatic plants, which vegetate nearer the surface, and rise less above it; on the outer part of this band, *confervas* (the green thread like plants that grow in stagnant water) surround the plants in question, like green clouds, almost concealing the fluid in which they grow. These latter form a bed in which *sphagnum*, bog moss, vegetates and renders the surface more compact. Beyond, still nearer to the firm land, the *sphagnum* becomes mingled with various marsh flowering plants, and with some even of the meadow grasses that delight in moisture; thus commences a zone on which cattle may occasionally pasture during the droughts of summer. A little beyond this the ground becomes more solid; hay may be made upon it at the proper season; it is the last stage of progress between the swamp and the meadow, and destined soon to become indistinguishable from the latter. Independent of its value in forming land from water, the reed growing along the banks of rivers serves to prevent the wearing away of their banks by the action of the current, and thus guards the low lands on either side against the liability to inundation. The banks of the Thames, and other English rivers are fortified in this manner, and much of the fine arable and pasture land now found in the valleys through which they flow, has been formed by the gradual contraction of their channels through the growth of this grass barrier.

Perhaps no grass is so widely distributed as *Phragmites communis*, as it is not only met with over the northern hemisphere in both continents and in our own from Lapland to Northern Africa, but is said to be indigenous in South Australia. It is, in an agricultural point of view, useless; as, apart from the necessary conditions of growth, the foliage is too coarse to be palatable to cattle in general. The stolons, like

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those of *Triticum repens*, *Glyceria fluitans*, and grasses of a similar habit, are sweet and nutritious." Mr. Roach, of Gloucestershire, in Morton's encyclopedia of agriculture, says: "In places suitable for it, that is too wet and boggy even for osiers, no plant will be found so profitable as *P. communis*. It grows where no other useful plant will. It requires no care or cultivation, and the only expense is in cutting it down. Though reeds are grown to the greatest extent in fens, yet the following will show that there is no farm possessing a portion of wet, undrainable land that may not be made to produce them. I have often seen them growing in the muddy bottoms of old clay pits, and knew an instance where roots of reed were transplanted into a pit from which many thousand bushels of peat ashes had been procured. This is, perhaps, the best use to which these pits, if undrainable, could be turned. Reeds flourish best in mud or moorish soil, with from a half to a whole foot of water flowing over their roots. They are hardly ever sown on purpose, and increase in ponds by their stolons or runners; yet, that they might be easily grown from the seed sown in mud or damp earth, and the plants transplanted, or from a division of roots, is evident. The piece of reeds I mean to give an account of, consists of a pond, or rather a marsh, of about four acres in extent; soil, peat mud; subsoil, hard gravel. The water is hardly ever more than one foot deep over the reeds. This marsh is surrounded by a ditch, and the water is drawn from it at pleasure through a "slot" or sluice at the outlet of this ditch. Probably this marsh was originally a fish pond, and the reed seed being of a flighty nature, like thistle-down, may have been brought thither by the winds or the birds. About the middle of March the pond is let off by the sluice till the pond is as dry as it can be got. Then the reed cutter goes with a pair of water boots on, and cuts it down with a hook of a scythe shape, the handle being four and a half feet and the blade one foot eight inches long. He should cut it as low as possible, in this manner: Holding a handful of reed in his left hand, he draws the hook toward him and rather upward; clears the rubbish, if any, from the bottom of the reed with his hands, and ties it up with osier twigs, at about one foot from the butts or lower ends, in "doubles" (*i. e.*, in bunches of two feet round), or "singles" of half this size. Having finished cutting, he chops down, with a thatching knife, the straggling reeds he has left. The reeds are laid in small heaps at the side of the pond, and afterwards carted away and stacked till wanted. The weather will not hurt them. These reeds are cut and tied up by a yearly contract; but in other places this may, no

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doubt, be done by number of bunches. After the reed is cut, the "slot" is let down, and nothing more is done to the pond all the year. The produce of the pond averages 2,000 "doubles," which, as reed sells for ten shillings or eleven shillings per hundred, *single* bunches, will amount to £20 from about four acres, and no expense is incurred except that of cutting down the reeds. All is consumed on the estate. Reed is used to thatch houses and farm buildings. It is the best roofing for dairies, and is often used for summer houses, for its neat appearance and coolness. Reed thatching is done in quite a different manner from that of straw. It always requires a "roving" or ridging of sedge or straw. Reed thatching is superior to slate, because it keeps the cold out in winter and the heat in summer. Reed thatch will last, it is calculated, about eighty years, if care is taken not to let moss, etc., grow upon it and eat into the thatch. It will, therefore, require to be cleaned every few years. I know several instances of buildings which have been reeded from fifty to sixty years ago, the thatch of which is still in very good condition.

Yards and gardens are often divided by reed fences, which have a very light appearance; the bottoms of these for about two feet are sometimes tarred, to preserve them better. They are erected thus: Posts six feet high are set into the ground, about seven or eight feet apart, and light spars are nailed over the reed on the other, and the whole is bound tightly with tar line. The sides of tile sheds, and other slight erections, are also sometimes formed of reeds in the same manner. The rooms of cottages are sometimes partitioned by reeds and plaster. Slight screens are also made of reed and laths for a protection to wall fruit; and reed is sometimes tied together with pack thread, and so formed into long rolls to cover glass, and in the culture of early salading. Reed coverings are formed exactly like those of straw, and are used chiefly for protecting glass, or forming protecting cones round tender shrubs or bee-hives of the common kinds." In addition to the economical applications of reed already mentioned we may remark, that the country people of Sweden use the panicle to dye woollen cloth green. Till the introduction of pens made from quills in the seventh century, they were in general use for writing. They are also used as a light strong shaft for arrows. The young shoots cut off from the root where they are not exposed to the light form an excellent pickle. Entomologists may often find a considerable variety of insects on the panicles, whither they resort for food and shelter; and it also furnishes an excellent shelter for wild fowl. The only use that we have known this grass put to in

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the United States, was in old times, when farmer's daughters wove and spun; they were accustomed to convert its joints into spools for yarn. It has never been analyzed to our knowledge. Fig. 157, *Phragmites communis* before the spikelets have opened and concealing the hairs. Fig. 155, glumes. Fig. 156, paleæ when open.

40. ARUNDINARIA.—Cane. Name from the Greek *arundo*, a reed, spikelets flattened, five to fifteen-flowered; the flowers somewhat separated on the jointed rachis. Glumes very small, membranaceous, the upper one larger. Paleæ herbaceous or somewhat membranaceous; the lower convex on the back, not keeled, many nerved, tapering into a mucronate point or bristle. Squamulæ three, longer than the ovary. Stamens three; grain oblong, free. Arborescent or shrubby grasses, simple or with fascicled branches, and with large spikelets in panicles or racemes; the flowers polygamous, viz., perfect and staminate.

1. *Arundo macrosperma.*—Not being familiar with this grass, we quote Professor Gray's description entire: Spikelets (one and one-half to three inches long), rather few in a simple panicle, sometimes solitary on a slender peduncle; leaves linear-lanceolate, pubescent beneath, in the small cane two-thirds to one inch wide, in the tall cane one to two inches wide. Culm of the latter sometimes twenty to thirty feet high, in cane-brakes; but it very rarely blossoms. In rich soil, Virginia, Kentucky, and southward. April. Fig. 157*a* is a magnified spikelet of A. macrosperma. Fig. 157*b* is a separate flower magnified.

41. LEPTURUS. Name from the Greek *leptos*, slender and *oura*, tail. The spikelets in this genus are solitary on each joint of the filiform rachis, and partly immersed in the excavation, one to two flowered. Glumes one to two, including the two thin pointless paleæ. Stamens three, grain free, oblong-linear, cylindrical. Low and branching, often procumbent grasses, chiefly annuals, with narrow leaves and slender spikes.

1. *Lepturus paniculatus.*—This very delicate and modest looking grass has its spikelets very much flattened, it usually has about eight flowers, but it is occasionally found with a dozen, or as few as five. The glumes are quite minute, panicle with from three to nine triangular small spikes disposed in racemes on the rachis. Culm slender, from eight to eighteen inches long, curved at its upper part. Flowers in August, and is found in Illinois and westward, especially around the salt licks.

42. LOLIUM.—Darnel. An ancient Latin name applied to this

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genus. Spikelets many flowered, sessile, solitary on each joint of the continuous rachis, placed edgewise. The glume, except in the terminal spikelet, only one and external, otherwise chiefly as in *triticum*. The deficiencies in the description of the genus will be supplied by an inspection of the figures. It is easily recognized by its many flowered sessile spikelets arranged edgewise and alternately on a zigzag rachis, and supported by a single herbaceous glume arising from the base and pressing against the outer edge. Sometimes a rudimentary glume is found next to the rachis.

1. *Lolium perenne*.—Spikelets ovate, seven to nine flowered, twelve to eighteen of them are arranged alternately on the flexuous rachis. Glumes (Fig. 159) single, except in the terminal spikelet, shorter than the spikelet, five-nerved, linear-lanceolate, mucronate. Paleæ (Fig. 160) herbaceous, equal, the outer palea of the lowermost floret shorter than the glumes, five-nerved, membranous, rather obtuse and entire at the summit, usually awnless, but it is sometimes met with awn-pointed. Inner palea sometimes a little longer than the outer, linear-lanceolate, ciliolate on the two green marginal ribs. Panicle spiked, somewhat arctuate, about six inches long. Culm one to eighteen inches high, erect, finely striated, bearing five or six leaves. Sheaths smooth, the upper one shorter than its leaf, the others longer than their leaves, with a short, obtuse ligule. Joints purplish, the first and second rather remote. Leaves dark green, broadly linear, smooth and glossy on the upper surface, roughish underneath. Root perennial (though not strictly so), fibrous. Flowers in June. It is not cultivated much in the United States, but has crept in spontaneously in the northern States, in some places to a considerable extent. It occupies the same place in Great Britain that timothy does with us, and is there esteemed on the whole higher than any other species of grass, and is called rye grass or ray grass. A part of its fame in Britain is doubtless owing to its having been the first that was actually cultivated there. Previous to its introduction the farmer depended wholly on the spontaneous seeding of his grass land, and left the whole operation to the care of Providence. The earliest notice of it in any book is found in a work of the learned Dr. Plat, called the Natural History of Oxfordshire, published in 1677, and in that of Staffordshire, published at a later period. In the former work he observes: "They have lately sown ray grass, *gramen loliaceum*, to improve cold, sour, clayey, weeping ground, unfit for saint foin. It was first sown in the Chiltern district, of the county in question, and afterward at Islip, by a person of the name of Eustace,

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an ingenious husbandman, who, though at first laughed at, has since been followed by those very persons who scorned his experiments." Stillingfleet, writing about a century ago, informs his readers that "this grass is well known and cultivated throughout all England, and it is to be hoped that the success we have had with it will in time encourage our farmers to take the same pains about some others that are no less valuable, and are full as easy to be separated; it makes a most excellent turf on sound, rich land, where it will remain." But on the following page he adds: "Many are tempted with the facility of procuring the seeds of this grass to lay down grounds near their houses, where they want to have a fine turf, with it; for which purpose, unless the soil be very rich, a worse grass cannot be sown, as it will certainly die off in a very few years entirely." Swayne, the author of *Gramina pascua*, as quoted by Withering, observed "there was reason to think that the common cultivated ray grass had, by constant sowing, degenerated from its natural qualities; that it was inferior in many respects to the ray grass growing naturally in our best meadows and pastures." Mr. Pacey, an enlightened agriculturist in the upper part of this county (Staffordshire), has lately raised a variety of ray grass, from seed selected from old pastures, and has now multiplied it to that extent as to sell annually a considerable quantity at the price of 10*s*. 6*d*. per bushel. It has been proved by the most competent judges to be infinitely superior to the cultivated ray grass, and he has a demand for all he raises. What can be the cause of the degeneracy of the cultivated sort?" Notwithstanding the general popularity of rye grass in England, there are some very conspicuous, influential and intelligent farmers who disapprove of it very strongly, and do not hesitate to recommend its abandonment; they assert, 1st. That it impoverishes the soil more than any other grass. 2d. That it is not truly perennial, often running out in from four to six years. 3d. That its short, fibrous roots do not take hold of the soil sufficiently to withstand drought. 4th. That it is less nutritive than many other kinds. 5th. That it must be positively unwholesome, as cattle never touch it after the seeds are ripe, and that no graminiverous bird ever touches a single one of its seeds. On the other hand, those who favor the grass, say, 1st. That no species of grass yields such an abundance of sound healthy seeds, and none is so little liable to the ravages of insects; forty bushels of seed to the acre are often gathered. 2d. They say that no grass is so adapted to such a wide variety of soils. 3d. That it grows and comes to maturity from the seed quicker than any other. 4th. That it produces an abundant supply of *early* and nutri

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tious herbage. We think it is not difficult to reconcile these conflicting statements. It must be remembered in the first place that there is no grass known that is so much disposed to run into varieties as this; no less than seventy, bearing different names, are known in Great Britain, many of which differ very much from each other. Some of these grasses yield eighteen bushels of seed to the acre, while others yield forty bushels; *L. perenne ramosum* yielded 305 pounds of nutritive matter to the acre; *L. perenne Russellianum* yielded 733 pounds to the acre. It is very easy to see that the farmer who raised a variety which gave forty bushels of seed and 733 pounds of nutritive matter to the acre would find it, and would most truthfully report it, as more exhaustive to the soil than he who only raised eighteen bushels of seed and 305 pounds of nutritive matter to the acre. Some of these varieties will only last two years, others will last six years, and others are so tenacious of life that they can never be rooted out. Of course we must expect very different testimonies with regard to the durability of rye grass, from the cultivators of these different varieties, which, however, are all known by the general name of rye grass. It is alleged by the special friends of rye grass, that it is adapted to a very great variety of soils; this is quite true, but only to a certain extent; any of the varieties will grow in almost any soil, but it will not necessarily be a remunerative crop. One variety, A, will grow luxuriantly in the soil B, and variety C will be permanent and yield a great burden on soil D; but variety C will scarcely pay for cutting on soil B, and variety A will be very unsatisfactory when raised on soil D. Each variety should therefore be restricted to the soil best adapted to it; and where this is strictly attended to, the grass is quite popular.

The tendency to run into new varieties is noticeable in this country, but not to the same extent as in England, probably for the reason that it is not *cultivated* here as it is there; but we often see plants with twice the altitude, and yielding twice as much seed, and bearing twice the number of root leaves that are found on others. Its abundance here is regulated in a great measure by the amount of rain that falls in the spring and summer months; where the greatest average rain fall occurs, there we always find the greatest abundance and the widest diffusion of rye grass. The varieties which are most esteemed in England are Pacey's *L. perenne ramosum*, which was the earliest variety cultivated, and which retains its popularity to the present day; many farmers will sow no other. It forms much more branched or bushy and leafy plants, with shortish and somewhat rigid stems,

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upright spikes, and short compact spikelets. Its seeds are short, plump, and heavier than those of common varieties. The produce of Pacey's rye grass was, according to the Woburn experiments, on a rich brown loam, at the time of flowering, about 7,827 pounds of grass, 3,389 pounds of hay, and 305 pounds of nutritive extract to the acre. The proportional value which the grass, at the time of flowering, bore to that at the time the seed was ripening, was as eleven to ten, and to the grass of the aftermath as five to two. Russell's rye grass, *L. perenne Russellianum.* This was thus named by Mr. Holditch, then editor of the Farmers' Journal, on account of the original plant from which he raised the first stock of seed having been pointed out to him by the Duke of Bedford. It is a variety characterized by a long, lanceolate, acute, ten-flowered spikelet, with an upright panicle, and an abundance of broad and long leaves, the upper leaf extending to the top of the panicle. Its produce on a rich brown loam was, on the 16th of April, equivalent to 5,445 pounds of grass, and 212 pounds of nutritive matter to the acre. At the time of flowering, it was 15,654 pounds of grass, and 733 pounds of nutritive matter to the acre. Stickney's rye grass is also a much esteemed variety, which has retained its place for about thirty years. It is distinguished by its peculiar light green color and more than ordinary length of culm. In its nutritive qualities it approaches very nearly to Russell's rye grass. Whitworth's perennial rye grass was named for the gentleman who first introduced it. He selected it as the best among sixty varieties that were growing on his grounds. Mr. Sinclair says that it seems to possess the valuable qualities of early and late growth in an eminent degree. He finds it superior even to the Russell in nutritive qualities, and to be finer in the foliage than any other. He named it Stoloniferous rye grass, in consequence of its surpassing all other varieties in the number and vigor of its barren or leafy root stems; a characteristic of permanence in duration (says Mr. Gorrie), exemplified in its adaptation for permanent pasture, in the most ungenial, cold and wet soils, and almost over-vitality, for alternate husbandry on more favorable localities, where its tenacity of life can scarcely be overcome by the plough." In case our American grass growers should ever desire to experiment more fully with this grass, some one of the above varieties should be selected for the purpose. Mr. Sinclair gives the following advice, which we are sure is of the greatest importance to all cultivators of the rye grass: "Attention should be paid to have the seeds of those grasses always supplied from their respective *original soils* or from *analogous soils*, that the

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valuable properties they now possess may be perpetuated." And he also gives a very valuable practical illustration of what the Whitworth rye grass is capable of doing. "About eighty acres of rather thin *wold* land, incumbent on chalk, was sown with the Whitworth rye grass and clover, the former predominant. In 1819, the first season of grass, the land kept some ewes and lambs until the 1st of May, when it was shut up for mowing. The produce of hay was fifty-four good wagon loads, but thirty acres were allowed to stand for seed, the produce of seed from two to three quarters (sixteen to twenty-four bushels) per acre. The pasture was laid in for about four weeks, then stocked with 500 lambs, which it kept for seven weeks, and afterward kept 160 lambs, with the help of a little hay given occasionally through the winter, and until the beginning of April, when 300 ewes and lambs were put in, and did well through the spring months." Fig. 158, *Lolium perenne;* Fig. 159, the single glume; Fig. 160, the paleæ. Of all the varieties of *L. perenne* which are known, that called *Lolium Italicum* is by far the most valuable. See Fig. 161. Its spikelets are conspicuously bearded, the flowers being all terminated by long, slender awns, which character distinguishes it very easily from *L. perenne*, as the fact that the glumes are shorter than the spikelets distinguishes it from *Lolium temulentum*. Its name is derived from the fact that its native habitat is on the plains of Lombardy, where broad and extensive plains of pasture land are frequently inundated by the mountain streams which intersect them. From Lombardy its cultivation has extended to Germany, France, Switzerland and Great Britain; but in all these countries its marked superiority has only been demonstrated in places where it could receive the same treatment which it was accustomed to in its native country. In other words, it is mainly adapted to irrigated meadows, and in these it is undoubtedly superior to any other grass. "The Italian rye grass," says Mr. Lawson, who had the merit of introducing it into Great Britain, "compared with any varieties of common rye grass, affords a stronger braird, arrives sooner at maturity, has a greater abundance of foliage (which is broader and of a lighter or more lively green color), grows considerably taller, is more upright, or less inclined to spread upon the ground. Its spikes are longer, spikelets more thickly set, and, upon the whole, producing a less bulk of seed, which is smaller, has the awn adhering to it, and is generally little more than half the weight per bushel of that of the common rye grass when grown under similar circumstances." He further adds: "If it be sown with clover or lucerne, its growth is so rapid

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that it will quickly choke them. It is eaten greedily by cattle, whether green or dry, and yields fifty per cent of hay. After the field is harrowed it is sown at the rate of from sixteen to eighteen pounds to the acre, and the seed rolled in." It is found in Europe to be more hardy than the common rye grass, for in the vicinity of Hamburg the common rye grass will not stand the winters when very severe, whereas the Italian rye grass withstands the severity of the winters even when sown in September, and consequently the plants are young and tender when the frosts prevail. The favor with which this grass has been received in Great Britain is amply attested by the successive enlargement of the sale of its seeds by the Messrs. Lawson, the seedsmen and nurserymen to the Highland and Agricultural Society of Scotland, whose first importation in 1831 amounted to 160 bushels, which they sold at forty-two shillings per bushel. In the year following, their imports, which were chiefly from Hamburgh, amounted to 320 bushels, which they sold at thirty-five shillings per bushel. In 1836 their sales swelled up to 1,000 bushels, at fifteen shillings. In 1840 their sales were 5,000 bushels, at ten shillings and sixpence. Up to this year they received their supplies from Hamburgh, but in 1841 they imported 6,000 bushels through the port of Leghorn from the highly cultivated region of Lodi and the plains of the Po, famed for the manufacture of the Parmesan cheese, and where the Italian rye grass forms almost the only food of the dairy cows. In 1850 their imports exceeded 25,000, which they sold at seven shillings and sixpence per bushel. Thus we see that their sales rapidly increased during a period of twenty years, and they sold the seed most of the time at a very high price. It is not possible that the farmers of Great Britain would have made these enormous purchases at such high prices, if they had not found that they made a good profit on their expenditure. Mr. Henry Colman, in his work on European Agriculture, tells us that: "The soil of Mr. Dickenson is a stiff clay, with which he mixes the rubbish gathered from the removal of old buildings in London, consisting of sand and lime. In 1844 he mowed his rye grass ten times. First in March, with about ten inches of grass; April 13th, a second time; May 4th, a third time; May 25th, a fourth time; June 14th, a fifth time; July 22d, a sixth time, with ripe seed and three loads of hay to the acre. Immediately after each of these crops, the land was watered once from a London street water-cart with one part of pure urine from the stables and two parts of water, the produce of each crop increasing with the temperature of the atmosphere from three

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quarters of a load per acre as hay to three loads per acre. The crop having shed a quantity of seed, he was doubtful the urine might injure its growing, so discontinued to water, but well harrowed it with iron harrows, and left it, expecting nothing more from it. It produced, however, three or four light crops afterward. In the next year, 1845, his first cutting was on the 6th of April. On the 22d of September the fourth crop on the land measured three feet, the sixth crop measured one foot and a half. On the 26th of January of this year, 1846, I (Rev. H. Colman) saw some rye grass which had been cut two or three days previously from his fields, which measured sixteen inches in length. This same field was mowed October the 30th last year. It has been cut again the 8th of this month (April) twenty-two inches long." "I was solicitous to know the actual amount of grass or hay probably obtained from an acre. He (Mr. Dickenson) took the trouble to weigh accurately the produce of a yard square of the fifth crop of grass of the season; and the following is his reply to me:

A yard of grass cut in the presence of Capt. Buller weighed five and three-quarter pounds.

Dried twelve days in the open air, two and three-quarter pounds.

Dried further three days in a room heated to fifty-nine degrees, two and three-quarter pounds.

Dried three days in a kitchen at seventy degrees of heat, and weighed two pounds ten ounces.

Roasted two hours before the fire, weighed two pounds six ounces."

Reckoning two thousand pounds to the ton, we have at the rate of thirteen tons, eighteen hundred weight, one quarter, two pounds, as the produce of grass to the acre. When dried at fifty-nine degrees, six tons, thirteen hundred weight, no quarters, ten pounds to the acre. When dried at seventy degrees, six tons, seven hundred weight, no quarters, five pounds. When roasted before the fire, five tons, fourteen hundred weight, three quarters, twenty pounds. These figures show conclusively that we have no grass which loses so little in drying as this, unless it be *Poa compressa*. Although Italian rye grass is best adapted for irrigated lands and will yield the greatest profit on such, yet it withstands severe droughts better than any other of our valuable grasses. The only grass of this species that we ever saw growing in this country was on the farm of Lewis G. Morris, one of the ex-presidents of the State Agricultural Society of New York, in the county of Westchester. The year was one characterized by a very severe drought, and all the neighboring meadows and pastures were brown and sere. Yet even then the field

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of Italian rye grass was green and beautiful, presenting a lovely picture to the eye, a perfect oasis amid the parched grass lands by which it was surrounded. Mr. Morris found when he fed it to his cattle that they gave an eager preference to it over any of the grasses on his farm, concurring fully with their British brethren and sisters in their judgment on the matter. Mr. Morris unfortunately allowed it to go to seed in that dry season before cutting it; as this is only an annual or at best a biennial, and as there was not rain enough to cause the seeds that were shed on the land to germinate, the species died out, and the difficulty of procuring new seeds deterred him from renewing it. The valuable qualities of this grass may be summed up as follows: Its habit of coming early to maturity, as exemplified above; its rapid reproduction after cutting; its wonderful adaptation to all domestic animals, which is shown by the extreme partiality they manifest for it, either alone or when mixed with other grasses; whether when used as green food for soiling, as hay or as pasturage, in which latter state its stems are never allowed to ripen and wither, like those of other grasses. One of its greatest recommendations is its beneficial influence on the dairy, not only in augmenting the flow of milk but in improving the flavor of the cheese and butter that are made from it. Its uncommon hardiness and capacity to withstand the vicissitudes of both wetness and dryness. The only set-off to all these valuable qualities is, that it is not perennial; but if fresh seeds are scattered over the meadow every second year, and the ground scarified with a sharp harrow and then rolled, there will be a constant succession of crops. According to the analysis of Messrs. Scheven and Ritthausen, it consists of: water, 71.7; protein, 2.6; fat, 1 0; heat producing matters, 12.9; woody fibre, 9.4; ashes, 2.3. According to the same authorities, *L. perenne* consists of: water, 7[illegible].2; protein, 2.3; fat, 0.6; heat producing substances, 9.5; woody fibre, 10.7; ashes, 1.6.

According to Mr. Way's analysis, *Lolium Italicum* consists of water, 75.61; protein, 2.45; fat, 0.80; heat-producing matters, 14.11; woody fibre, 4.82; ash, 2.21. *Lolium perenne* consists of water, 71.43; protein, 3.37; fat, 0.91; heat producing matters, 12.08; woody fibre, 10.6; ashes, 2.15. The discrepancies of the results obtained would seem to call for renewed experiments. In conclusion we cannot refrain from the expression of the opinion that the introduction of *L. Italicum* into this country, especially by those who have the means of irrigating their lands, would be an unspeakable benefit to all concerned.

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2. *Lolium temulentum*—(Fig. 161*a*). Bearded darnel. Spikelets, five to seven-flowered, otherwise as in the preceding. Glume (Fig. 161*b*), longer than the spikelets (occasionally found with a short inner glume), linear with eight nerves, five of which are quite obscure, and are only seen in a good light and with a strong lens. Outer palea (Fig. 161*c*), seven-nerved, bifid at the summit, with a rough awn, generally longer than the flower, arising immediately behind the apex. Seeds elliptical, somewhat flattened. In most other respects very much as in *L. perenne*. Flowers early in July and is found in grain fields. The grain is poisonous, which is about the only instance of the kind in this family. If the seeds are malted with barley, the ale causes intoxication very suddenly. The effects produced by the seeds are much like those produced by the ergot of rye, commencing with headache and dizziness, imperfect vision and other symptoms of intoxication. "It is generally considered by commentators," says Mr. C. Johnson, "that the word *zizania*, occurring in the parable in the 13th chap. of St. Matthew, translated from the Greek version as *tares* sown by an enemy among the wheat, refers to darnel. The word is not Greek, but a Greek rendering of the Syriac *zizani*, whence the present Arabic and Turkish name of this noxious and troublesome weed, *zizwan*. The manner in which it is still separated from the wheat in some parts of Syria, drawing up both together by the hand, and afterward collecting the darnel stems in bundles apart from the corn, is perfectly consistent with the close of the parable in verse 30." Great numbers of cases are recorded in medical treatises of poisoning by this substance. Mr. Gorrie says that he has heard old farm laborers in the best wheat districts in Scotland relate the terrible things that they had seen and felt in the "dear years" toward the end of the last century, when compelled by necessity to use the produce of inferior wheat, mixed, as it then too often was, with the pernicious "doits" (the Scotch name for darnel).

A small farmer near Poictiers, in France, died in consequence of persevering in the use of bread so circumstanced, while his wife and servant, who discontinued to eat it after the earlier symptoms, recovered. In some instances people have lost their limbs by gangrene after living for some time on meal in which any considerable quantity of darnel grain was mingled. Between thirty and forty years ago, according to Dr. Christison, "almost the whole of the inmates of the Sheffield work-house were attacked by symptoms supposed to be produced by their oatmeal having been accidentally adulterated with lolium." This poisonous grass is fortunately very rare in this coun-

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try; but in view of the dangers which may result from its use, it will perhaps be useful to give Mr. Ruspini's test as a measure of protection, viz: "The adulterated flour may be detected by digesting in alcohol, which, when *L. temulentum* is present, assumes a characteristic *green tint*."

43. TRITICUM—Wheat grass. Name from the Latin *tritum*, because it is beaten or ground for food. The spikelets sessile, three to many-flowered, single at each joint, and placed with the side against the rachis. Glumes transverse (*i. e.*, right and left), nearly equal and opposite, herbaceous, nerved. Lower palea very like the glumes; convex on the back, pointed or awned from the tips; the upper flattened, bristly-ciliate on the nerves, free or adherent to the groove of the grain. Stamens three. The true species are annuals, with the glumes ovate-oblong and ventricose boat-shaped, as in common wheat. Others are perennial, with nearly lanceolate acute glumes, and two-ranked spikes, never furnishing bread corn, to which the following belong:

1. *Triticum repens*—(Fig. 162). Couch grass, quitch grass, quack grass, dog grass. The spikelets are four to eight flowered, usually five-flowered, oval in form, elongated, about one-half an inch long, sessile, arranged distichously on the zig-zag rachis. Glumes (Figs. 163 and 164*a*), herbaceous nearly equal, sharp-pointed, keeled, upper part of the keel generally toothed. Strongly four to seven-nerved, transverse (*i. e.*, from right to left). Paleæ (Fig. 164), vary considerably in the same floret, some being strongly nerved throughout, some only nerved at the top, and others in which the nerves are very obscure, rough awn-pointed, but the awn only about one-third of the length of the palea, sometimes there are no awns; ciliate on the margins and generally on the nerves; upper palea shorter, ciliate on the margins. The spike is three to five inches long, though we have found them as long as seven inches, the rachis jointed, compressed, flexuous; the spikelets are arranged on it *flatwise* and alternately, rough on the angles. Culm one to two feet high, sometimes three and a half feet, but very rarely; smooth, striated, bearing five or six smooth sheaths, the upper sheath shorter than its leaf, and surmounted with a very short truncate ligule; leaves dark green, the upper leaf broader than those of the root, roughish and frequently hairy on the inner surface, sometimes glaucous. Rhizoma creeping extensively, and penetrating deeply into the earth, perennial. Flowers June to August, in almost all meadows and pastures northward. The farmers of the United States unite in one continuous howl of execration

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against this grass, and it seems strange when every man's hand is against it, that it is not exterminated. The British farmer even surpasses his American brother in the heartiness of his maledictions on the quitch (as he calls it). And yet we could never really satisfy ourselves that its presence in meadows and pastures was such an unmitigated curse. In lands where alternate husbandry is practiced it must be admitted to be an evil of great magnitude. Its long underground stems penetrate the ground in every direction; when broken up by the plow or spade every fragment vegetates independently, and it can only be eradicated with the utmost difficulty. Its hardiness is such, and its rapidity of growth is so great, that it springs much more rapidly than any crop that can be planted, and chokes it. Corn, rye and wheat are all very greatly injured by it; it sometimes bores its way through potatoes, turnips, and other root crops. Still it has many virtues. It is perfectly cosmopolitan in its habits; it is found in all sorts of soils and climates, though it is rarely or never found more than one thousand feet above the sea level. Its creeping stems are succulent, sweet and very nutritive, and are greedily devoured by horses and cows. In the south of Europe the peasants collect them from the road sides and waste grounds in large quantities for the purpose of carrying them to the town markets as horse food. Considerable profit is made by the poor about Naples in this way. The flavor is something similar to licorice root, and Sir. H. Davy found that they contained about three times the amount of nourishment that exists in the leaves and stems. Withering informs us that "when dried and ground to meal they have been made into bread in years of scarcity," adding "that the juice of them drank liberally is recommended by Bœrhave in obstructions of the viscera, particularly in cases of schirrous liver and jaundice." Dogs and cats eat it instinctively when they are sick as well as *T. caninum;* it promotes vomiting, and may perhaps produce other unknown specific effects. It is admirable for restraining sloping banks from sliding, its long rhizomes interlacing so effectually and penetrating so deeply into the soil that a lapse very rarely takes place. It starts very early, and grows rapidly very early in the spring, and the cattle relish it very much; they do not, however, eat it very readily when the seed culms make their appearance. It makes pretty good hay, but does not yield a very heavy burden of it. It was believed by the older botanists that wheat was derived from the superior cultivation of the seeds of this grass, coupled with careful selection of the seeds of the best samples; but it is now universally admitted that they

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were mistaken. In addition to the synonyms given above, we may remark that it is known as wheat grass on the banks of the Connecticut river and Chever grass in Worcester county, Masschusetts.

The following measurements were taken from a plant a little larger than the average: Five stems grew from one root. The principal stem was three feet three inches long. The spike seven inches long. The spikelets nine-sixteenths of an inch long. There were twenty-seven spikelets on the rachis. The base of the upper leaf is eight inches below the lowest spikelet. The lowest leaf was quite dried up and was nine inches long; the next leaf above was nine and a half inches long; the next (third from the bottom) was eleven inches long; the upper leaf was ten inches long and half an inch wide. The ligule almost obsolete. Leaves rough on the under side and on the edges. The shoot next in size to the principal one was two feet three inches long; spike, three and five-eighths inches; lowest leaf, eight and a half inches long and dried up; the next above (second from bottom) nine and one-eighth inches; upper leaf, nine and a quarter inches. The third shoot in size was twelve inches high, had no spike, but was measured from the bottom to the end of the highest leaf. The fourth shoot measured ten and a half inches; the fifth shoot measured three and a half inches. The outer palea, including the awn, was half an inch long; excluding the awn, it was thirteen thirty-seconds of an inch. The inner palea was ten thirty-seconds of an inch long, and was notched at the apex. Portions of the fleshy part of each leaf had been eaten by an insect; some were eaten out lengthwise of the leaf, others crosswise, and some in irregular patches.

2. *Triticum caninum.*—Much like the last in all respects except that the awns are longer than the paleæ, which are smooth. The most marked difference, however, is that the root is fibrous. It is found in woods, and occasionally in fields, from Western New York to Wisconsin, and northward, and grows well in shady places. We have an analysis of this grass by Messrs. Scheven and Ritthausen, according to which it contains: of water, 70.0; protein, 2.8; fat, 0.7; heat producing principles, 11.6; woody fibre, 12.7; ash., 2.1.

According to the Woburn experiments, the produce per acre on a sandy loam at the time of flowering, was 12,251 pounds, which lost 7,350 pounds in drying and afforded 478 pounds of nutritive matter, which exceeded the nutritive matter afforded by an acre of *T. repens* 96 pounds. At the time of ripening the seed the produce was 10,890 pounds, which lost 4,628 pounds in drying and gave 340 pounds of nutritive matter. The produce of the aftermath was 3,062 pounds,

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which gave 95 pounds of nutritive matter. English authors all give a very great preference to this over *T. repens*, but the experience of farmers in this country does not confirm the opinion they express. Mr. Sinclair, speaking of it, says:

"It appears that this grass is of considerable value, more particularly as it affords herbage early in the spring, in a degree superior to rye grass, sweet-scented vernal, and nearly equal to the meadow foxtail. It produces a sufficiency of seed, which vegetates quickly, and the plants soon arrive at perfection in almost every kind of soil, except such as are tenacious or retentive of moisture. If to these valuable qualities it added late growth, or a proportional supply of lattermath, it would rank high among the superior grasses; but in this it is deficient, as are most of the grasses which produce early foliage in the spring; the cocks-foot, tall oat-like soft grass, Taunton's meadow foxtail, and meadow soft grass, are the only exceptions properly to this point."

"On soils of an inferior quality it might be cultivated to advantage instead of rye grass, but for soils of the best quality it does not as yet uphold a sufficient claim, the awns of the spike being objectionable. It flowers about the first and second week of July, and the seed is ripe generally about the end of July and beginning of August." Fig. 164*b*, *T. caninum;* Fig. 164*c*, glumes enlarged; Fig. 164*d*, paleæ enlarged; Fig. 164*e*, lower glume with hairs.

3. *Triticum dasystachyum.*—We are not familiar with this species, but copy the description given by Prof. Gray, which is as follows: Culm one to three feet high, from a strong creeping root-stock; narrow almost involute leaves, very smooth and glaucous; spikelets downy-hairy all over; whitish, five to nine-flowered; glumes, five to seven-nerved; rachis rough on the edges; awn sometimes about half the length of the flower, sometimes nearly wanting. Flowers in August. Found on sandy shores, Lake Huron and Superior and northward.

44. HORDEUM—Barley. The ancient Latin name. Spikelets one-flowered with an awl-shaped rudiment on the inner side, three at each joint of the rachis; but the lateral ones usually imperfect or abortive, and short stalked. Glumes side by side in front of the spikelets, six in number, forming a kind of involucre, slender and awn pointed or bristle form. Paleæ herbaceous, the lower (anterior) convex, long awned from the apex. Stamens three. Grain oblong, commonly adhering to the paleæ. Rachis of the dense spike often separating into joints.

1. *Hordeum jubatum.*—Squirrel-tail grass. Spikelets as in the

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generic description, closely crowded on the jointed rachis. Glumes one and one-half to two inches long, mostly bristle form throughout, but on close inspection some of them will be seen to have a slight valvular expansion at the base, which is oftenest seen in the pair opposite to the fertile palea, glume bristles rough. Lower palea five-sixteenths of an inch long, convex on the back, margins involute, bearing an awn one and one-half to one and three-quarter inches long from its apex which is rough, indistinctly three-nerved, lanceolate, upper palea linear, involute. Culm short, slender. Sheaths smooth, striate, loose: ligule short, truncate, minutely toothed at the top. Leaves smooth, the upper one larger than its sheath, and generally inclosing the lower part of the rachis and spike. Annual. Flowers in June. Found in marshes and moist sand of the sea shore and the northern lakes. Fig. 164*f*, the three one-flowered spikelets from one joint of the spike with their awn-like glumes, the lateral flowers abortive and neutral, the middle one alone perfect. Fig. 164*g*, the perfect flower open and enlarged.

2. *Hordeum pusillum*.—Spikelets as in the generic description, three-fourths of an inch long. The middle glumes much broader at the base than in No. 1; the two exterior ones rise from an awl-shaped base, obscurely nerved, central rib prominent at the upper portion; awn one-half inch long, rough on the nerves. Lower palea of the fertile flower indistinctly three-nerved, one-fourth of an inch long, lanceolate, terminated by a stout awn almost twice its length. Inner palea shorter, linear, distinctly nerved. Spikes, one and one-fourth to one and one-half inches long, linear. Culm ten to twenty inches long, bearing four or five leaves, the upper one much shorter than its sheath. Sheaths smooth, loose. Ligule short, lacerated at the summit. Root leaves three to four inches long; upper ones two to three inches, about one-eighth of an inch wide. Annual. Root fibrous; grows in saline soils, Ohio, Michigan, Illinois, and westward. In the closely allied *H. maritimum*, of Europe, it has been observed that the awns cause irritation of the gums and disease among horses. We know nothing of the agricultural properties of the two species above described.

H. distichum is the common two-rowed cultivated barley.

H. vulgare is the common four and six-rowed barley.

45. Elymus.—Lyme grass, wild rye. From the Greek *eluo*, to roll up, in allusion to enwrapping paleæ. Spikelets two to four at each joint of the rachis, all fertile and alike, sessile, each one to seven flowered. Glumes conspicuous, nearly side by side in front of the spikelets, two

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for each spikelet, forming an involucre to the cluster. Paleæ coriaceous; the lower rounded on the back, acute or usually awned at the apex. Grain adherent to the involving paleæ.

1. *Elymus Virginicus.*—Spikelets two to three together, two to three-flowered. Glumes lanceolate, strongly five-nerved, equal, slightly reddish, one inch long. Lower palea five-nerved, growing less distinct at the lower end; the central nerve terminating in a rough awn, with the teeth pointing upward, three-fourths of an inch long; awn channeled. Inner glume blunt, equal to the outer; spike erect, dense, thick; culm two to four feet high, erect; sheaths smooth or pubescent; ligule very short, hardly discernible; leaves broadly linear, ten to fifteen inches long, bright green, rough. Flowers in August; river banks, frequent on the lower Hudson river. Fig. 164*h*, the two spikelets of one joint of the spike about the natural size; Fig. 164*i*, the glumes and the flowers of one spikelet, enlarged and displayed; Fig. 164*k*, an open flower more magnified.

2. *Elymus Canadensis.*—Spikelets mostly in pairs, of three to five flowers, one to one and one-fourth inches long, remote on the rachis. Glumes narrow, tapering to an awn which is shorter and straighter than the awn of the palea, three to four very strong nerves, awl-shaped. Lower palea inconspicuously nerved at the base, but prominent near the apex, terminating in a delicate curved awn, the nerves clothed with short hairs, about three-eighths of an inch long, and including the awn one and one-fourth inches. Upper palea rather obtuse and ciliolate on the margins; spike five to eight inches long, loosely flowered, drooping; culm three to five feet high; sheaths smooth; ligule very short and inconspicuous; leaves broad, linear, flat, sometimes a little glaucous, eight to twelve inches long. Flowers in August; found on the banks of rivers; seed bearded at the summit. It is easily distinguished by its *drooping* spike, its *remote* spikelets, and its *curved awns*. No. 1 has a *straight spike and awns*, and the spikelets are *crowded* on the rachis. We have never seen cattle crop any of the members of this genus, and are quite ignorant whether they have any agricultural value.

3. *Elymus striatus.*—Spikelets mostly in pairs, one to two-flowered (rarely three-flowered.) Glumes linear-lanceolate having three green nerves and tipped with a rough awn which is shorter than the glume; with the exception of the nerves their color is yellowish; armed on the margins with short, stiff teeth. Lower palea hispid over the entire back, with longer hairs on the margins, terminating in a rough awn about three-fourths of an inch long; palea about half as long as the

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awn. Upper palea about as long as the lower one, obtuse, hispid on the margins. Spike densely flowered, more slender and more drooping than No. 1, but less drooping than No. 2, from three to four inches long; culm two to three feet high, erect; sheaths hairy; leaves one-fourth of an inch wide, pubescent above, sometimes with long white hairs, eight to fifteen inches long, flat, dark green. Flowers in July; banks of rivers and rocky hill sides. This is the most slender form of *Elymus* known in this country. There is a variety of this species known as *E. villosus*, which has stouter spikes and very hairy glumes.

4. *Elymus mollis.*—Spikelets two or three upon each joint, five to eight-flowered. Glumes one inch long, lanceolate pointed, five to seven-nerved; paleæ pointed, soft, villous; culm stout, three feet high, its apex velvety; rachis of the spikelets separating into joints; spike thick, eight inches long, erect. Found on the shores of lakes Huron, Superior, and northward. Not being acquainted with this species we have described it from Professor Gray. This species is very closely allied to the European *E. arenarius.*

46. GYMNOSTICHUM.—Bottle-brush grass. Name from the Greek *gumnos*, naked and *stichos*, a rank. Spikelets two to three (or sometimes solitary) on each joint of the rachis, raised on a very short callous pedicel, loosely two to four-flowered (when solitary placed flatwise on the rachis). Glumes none, or small awn-like, deciduous rudiment.

1. *Gymnostichum hystrix.*—Spikelets one and a half to one and three-fourths inches long, very early deciduous from the pedicel which is hard and warty, placed alternately on the flat zig-zag rachis about one-fourth of an inch apart. Lower palea smooth (in our specimens), indistinctly three ribbed, about one-fourth of an inch long, tipped with a triangular awn about one and one-eighth inches long, its edges rolled over those of the upper one. Upper palea blunt, coriaceous, nearly as long as the lower one. Spike four to six inches long; spikelets at first appressed to the rachis, but afterward spreading almost horizontally. Culm erect, two to four feet high. Sheaths villous and deeply striate. Ligule wanting, or supplied by a short tuft of hairs. Leaves hairy, with very strong ribs, six to eight inches long, flat. Flowers in July. Moist wood lands and shady places. It is a native of the Levant, and has a very peculiar and unmistakable appearance; it resembles very much the brush used by druggists for washing bottles, hence its trivial name; and with this hint no one would fail to identify it if he met with it. It has no known economic value. Fig.

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164*l*, a spikelet of *G. hystrix;* Fig. 164*m*, an expanded flower magnified.

47. AIRA.—Hair grass. Name from the Greek *aivo*, to destroy, a name given by the Greeks to *Lolium temulentum* on account of its poisonous properties, but has no application to this genus. Spikelets two-flowered, in an open diffuse panicle; the (small) flowers both perfect (sometimes with a third imperfect), usually shorter than the membranaceous keeled glumes, hairy at the base; the upper remotish. Lower palea truncate and mostly denticulate or eroded at the summit, bearing a slender, bent or straight awn on its back. Stamens three. Styles plumose to the base. Ovary glabrous. Grain oblong.

1. *Aira flexuosa.*—Spikelets from two-sixteenths to three-sixteenths of an inch long, two-flowered. Glumes unequal, the inner longest, scarious, lanceolate, acuminate, tinged near the base and central nerve with purple, without lateral nerves. Lower palea oblong-lanceolate, toothed at the apex and obtuse, five-nerved, having a tuft of whitish hair and a geniculate awn springing from the base, the awn being nearly twice the length of the palea; upper palea notched at the summit. Panicle spreading, loose. Branches capillary, the lower in twos, the upper generally single, smooth. Panicle from three to four inches long, the branches generally triple forked. Stem erect, twelve to twenty inches high, bearing two or three leaves, with striated sheaths which are rough from above downward. Ligule membranous, acute; leaves filiform, the upper one much shorter than its sheath, about three inches long. Root leaves numerous, three or four inches long. Root perennial, fibrous, woolly in sandy ground. The seeds in all our specimens have been blasted. It delights in dry sandy soil, where it grows in tufts and has a glossy appearance in the sun; where sheep have access to it they seldom allow it to flower, but gnaw it close to the ground. It is more productive on its favorite soil than *Festuca ovina;* but it requires a deeper soil, though not a richer. In the Woburn experiments, at the time of flowering, the product of grass from a heath soil incumbent on clay, was 10,209 pounds per acre, which lost 6,891 pounds in drying, and gave 319 pounds of nutritive matter. At the time the seed was ripe, the grass weighed 9,528 pounds, which lost in drying, 5,955 pounds, and gave 297 pounds of nutritive matter. Comparison made by careful weighing, between the yields of this grass on a clayey loam and a heath soil showed that the product of the latter was twice as great as the former; after a few years it entirely vanished from the clayey soil. Fig. 165, *Aira*

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flexuosa; Fig. 166, glumes; Fig. 167, paleæ of both flowers; Fig. 167*a*, spikelet natural size.

2. *Aira cæspitosa.*—Spikelets numerous, small, glossy. Glume oblong-lanceolate, reddish in the center, with yellowish scarious margins, sharp pointed, subulate, unequal; the inner one longer, three-nerved. Flowers much as in No. 1, except that the awn does not exceed the palea. Ligule longer than No. 1, and more acute. Flowers in June and July. Found on the shores of lakes and streams. It has a very unsightly mode of growth, forming large tussocks, which, when numerous, are very difficult to get rid of. The cattle seldom eat the rough, coarse leaves. It is cosmopolitan in its habits, being found in the dryest as well as in the wettest, in heathy, sandy and clayey soils; but it grows best in clay soils where water stagnates; its limit of altitude is about 1,500 feet above the level of the sea. Hogs seem very fond of this grass, and they are the only animals that appear to enjoy it. It is valued in England and in sporting countries as a cover for game, and is sometimes extensively sown with this sole object. This grass plays an important part in the economy of nature; the rough tussocks, so annoying to the farmer where they occur in the meadow, resisting the swing of the scythe and blunting its edge; when they occur in low marshy lands, which are liable to be overflowed by rivers, are the means of causing the deposition of mud from the waters, by arresting their flow, and thus giving time for them to deposit the mud which had been diffused through them, and in this way the land is gradually elevated and made more valuable. Although it has not a creeping root, yet its short underground stems which interlace with the roots, renew its vitality when the tussocks are torn out, and thus it soon becomes renewed by a new growth from these, much to the farmer's discomfort. Nothing short of paring and burning seems to be effectual for its extirpation, without the land is thoroughly drained, in which case, if the ground is well seeded with the more valuable grasses, it soon runs out. Its seeds weigh from twelve to fourteen pounds to the bushel. According to the Woburn experiments, the produce of this grass to the acre at the time the seed was ripe, was 10,209 pounds, which lost 6,891 pounds by drying, and gave a nutritive extract of 319 pounds. According to the analysis of Messrs. Scheven and Ritthausen, it contains at the period of bloom, 70.3 of water, 3.1 protein, 1.0 fat, 10.1 heat producing principles, 7.0 woody fibre, 2.0 ash. Fig. 168, *A. cæspitosa;* Fig. 169, glumes; Fig. 170, paleæ and awns of both flowers; Fig. 170*a*, spikelet natural size.

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3. *Aira atropurpurea.*—Spikelets broadly ovate. Glumes boat shaped, about one-fourth of an inch long, acuminate, serrulate on the keel, generally purple, but occasionally of a yellowish green color, longer than the flowers. Both the flowers perfect, having a tuft of long hairs at the base, the upper one on a *short thick* pedicel. The lower palea coriaceous, nerveless, the summit a little hairy, obtuse, and generally entire, but sometimes a little toothed; the awn is thick and borne at or above the middle, slightly twisted below, twice the length of the palea. Culm eight to fifteen inches high, simple, erect, slender. Panicle loose, the branches mostly in pairs, and spreading. Leaves two to three inches long, one-eighth to two-eighths of an inch wide, smooth on both sides. Sheaths smooth, striate; ligule oblong, obtuse. Flowers early in August. Found on the tops of the White mountains, and those of New York.

48. DANTHONIA—Wild oat grass. Named for Danthoine, a French botanist. Lower palea (oblong or ovate, rounded cylindraceous, seven to nine-nerved), bearing between the sharp-pointed, or awn-like teeth of the tip, an awn, composed of the three middle nerves, which is flattish, and spirally twisting at the base; otherwise nearly as in *Avena.* Glumes longer than the imbricated flowers.

1. *Danthonia spicata.*—Spikelets from three-eighths to one-half inch long, wedge-shaped, seven-flowered. Glumes about equal, longer than the flowers, generally tipped with reddish, lanceolate, sharp pointed, keeled, the outer one three-nerved with two short ones outside near the base. Lower palea ovate, clothed on the back with long white hairs; the apex is two-toothed, between which a spirally twisted geniculate awn arises about one and one-fourth inches long. Inner palea hyaline, with two green nerves on the ciliate margins, about two-thirds of the length of the lower one. Panicle one to two inches long, generally simple, but the lower branches sometimes divided, racemose, generally secund, four to seven spikelets closely appressed to the rachis on short pedicels. Culms one to one and a half feet high, erect, slender. Sheaths loose, striate, hairy. Leaves very narrow, the culm leaves filiform, more or less hairy, the upper leaf much shorter than its sheath, about one inch long; root leaves numerous. Ligule very short, chartaceous, truncate. Seed corrugated somewhat, two horned at the apex. Flowers in July. Found in poor, clayey soils. We have no analysis of this grass, nor do we need one, as its physiognomy reveals its bad qualities unmistakably. We once had a very dry year, when our clay meadows bore scarcely anything but Danthonia. The scythes

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had to be ground twice a day or they would slip over the slender culms without cutting them. When it was fed to the cattle in the winter, although the mangers were kept well filled, they bellowed with hunger. The horses became hide-bound and the cows shrank in their milk. They got along very well when they were fed twice a day with timothy and blue grass, and were allowed to pick at the Danthonia at intervals as they felt inclined for it. It was rather better than rye straw, but not much. Still, as it will grow on hard clay lands where nothing else will, it might be worth while to sow its seed on such lands, as it is certainly better than nothing; but the better plan is to manure the soil, so that it will produce the richer grasses. Fig. 171, panicle; Fig. 171*a*, spikelet enlarged; Fig. 171*b*, one flower of the same, enlarged; Fig. 171*c*, palea and awn;

The following are the measurements of a somewhat larger specimen of *Danthonia spicata* than the average: Culm two feet eight inches. Panicle two inches; it has six branches, all of which are single; the lowest branch is one and one-sixteenth inches long; it has four leaves; the lowest is four and three-fourths inches long; the second leaf, four and one-fourth inches; third leaf, three inches long; fourth leaf, two and one-fourth inches. The base of the upper leaf is seven and one-fourth inches below the base of the panicle. Glumes nearly equal, three-eighths of an inch long. Some branches have two spikelets.

2. *Danthonia compressa.*—This is a new species discovered and described in 1868, by Mr. Coe F. Austin. Spikelets five-flowered. Glumes equal, five-nerved below (only the middle nerve reaching above the middle), five lines long, elliptical, lanceolate, with broad membranaceous whitish margins and a whitish apex. Lower palea apparently seven-nerved *by the seven lines of white silky hairs on its back*, concave, broadly margined above, ciliate below, bifid, the teeth very slender and exceeding the glumes (about half as long as the body of the palea), whitish awn, about twice as long as the teeth, pale or slightly colored at the flat, slightly twisted base; inner palea shorter, spatulate by the broadly revolute lower margins, the margins above nicely recurved and finely ciliate, the apex obtusish. Culms subcæspitose, slender, weak and reclining, minutely scabrous below the pale joints, otherwise entirely naked, compressed, triangular, with the narrow side paler and concave, the other sides slightly convex. Leaves very long and narrow, those of the root about reaching to the short racemose or spiked nodding panicle, the uppermost much exceeding and drooping over it, naked (as well as are the

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sheaths), minutely roughened on the veins and margins. Ligule all ciliate, with long white silky hairs. Panicle sparingly branched, consisting of eight to ten spikelets, the lower branches more or less spreading, the rest erect.

There can be no difficulty in identifying this species by the awn like teeth on either side of the awn, which are longer and sharper than in *Trisetum*. The panicle is two to three inches long. The lower palea has a tuft of short hairs at the base. It may be distinguished from *D. spicata* at a glance by its long leaves. Flowers in July, and the specimen from which the description was taken was found in the woods of W. R. Stevens, Danube, Herkimer county, N. Y.

49. TRISETUM. — From *tris*, three and *seta*, a bristle. Spikelets two to several flowered, often in a contracted panicle; the lower palea compressed-keeled, of about the same membranaceous texture as the glumes, bearing a bent or flexuous (rarely twisted) awn below the sharply two toothed or two pointed apex (whence the name), otherwise nearly as in *Avena*.

1. *Trisetum subspicatum.* — Spikelets two to three flowered. Glumes about the length of the flowers, a little unequal, acute, rough on the keel. Lower palea compressed-keeled, with two sharp teeth at the apex between which the awn arises and is much exserted, about the length of the palea; the upper palea two-keeled. Panicle contracted, two to three inches long, the branches appressed and pretty densely flowered. Culms ten to fifteen inches high, cespitose, erect, slender, the pubescence mostly retrorse (*i. e.*, directed backward). Leaves narrow one or two inches long, flat, hairy at the base. The whole plant is pubescent. Perennial. Flowers in July. Mountains and rocky river banks. Northern New England to Wisconsin, and northward; rare. Fig. 172, *T. subspicatum;* Fig., 173, spikelet; Fig. 174, rudimentary flower; both enlarged.

2. *Trisetum palustre.*—Spikelets flat, one-fourth of an inch long, yellowish white tinged with green; glumes shorter than the two smooth lanceolate flowers of which the spikelet is composed; the upper flower is on a slightly naked joint of the rachis, and bears a slender spreading or bent awn next the short two-pointed tip, while the lower one is commonly awnless, or only mucronate pointed; culms slender, two to three feet high. Perennial. Flowers in June, and is found from southern New York to Illinois, and southward. As far as is now known, it has no agricultural value.

50. AVENA. — Oat the classical latin name. Spikelets two to

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many flowered, panicled; the flowers herbaceo-chartaceous, or becoming harder, of firmer texture than the large, and mostly unequal glumes; the uppermost imperfect. Lower palea rounded on the back, mostly five to eleven-nerved, bearing a long, usually bent or twisted, awn on the back, or below the acutely two-cleft tip, proceeding from the mid nerve only. Stamens three. Grain oblong-linear, grooved on one side, usually hairy, free, but invested by the upper palea.

1. *Avena striata.*—Spikelets one-half to three-fourths of an inch long, three to five-flowered, oblong-lanceolate. (Fig. 174*a*.) Glumes purple, unequal, the inner longest, three-nerved, ovate-lanceolate, acute, white and scarious at the apex. Lower palea about three-eighths of an inch long, bearing an awn on the back about the same length, which arises just below the sharp cuspidate two-cleft tip at the apex, and which is bent somewhat obliquely, it has a short bearded tuft at the base, seven-nerved. (Fig. 174*b*.) Upper palea acute with two marginal ciliate nerves; its point extends to the base of the teeth of the under one. Panicle loose, drooping, nearly simple. Lower branches in twos, rough capillary, secund, three to five inches long. Culm tufted, slender, one to two feet high, smooth. Sheaths close, conspicuously striate. Ligule very short. Leaves three to four inches long, narrow, smooth. Flowers toward the last of June. Known to some farmers as the purple wild oat. Rocky hills, northern New England, New York, and northward. Of no known agricultural importance.

2. *Avena præcox.*—A dwarf species three or four inches high, branches of the small oblong panicle appressed; awn from below the middle of the flower. Sandy fields, New Jersey to Virginia. We have never seen this species, but give the illustration from Dr. Parnell. (Fig. 175, *Avena præcox;* Fig. 176, glumes enlarged; Fig. 177, both flowers and paleæ and awns.) *Avena sativa* is the common cultivated oat.

51. ARRHENATHERUM.—Oat grass. Grass of the Andes. Name from the Greek words *arren* masculine, and *ather*, awn. Spikelets open-panicled, two-flowered, with the rudiment of a third flower; the middle flower perfect, with its lower palea barely bristle pointed from near the tip; the lowest flower staminate only, bearing a long bent awn below the middle of the back, otherwise as in *Avena*, of which it is only a peculiar modification.

1 *Arrhenatherum avenaceum.*—Spikelets brownish, two-flowered, the lowest one staminate. Glumes unequal, scarious, the lower one

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shorter than the flowers, the upper three-nerved, rough on the keel. The outer palea of the lowermost floret about the length of the glume, acute, roughish, seven-nerved; the central rib roughish, hairy at the base, furnished with a long slender awn, longer than the palea, and arising from a little above the base, generally much contorted; inner palea membranous, linear, acute, minutely fringed on the margins. The second floret elevated on a short hairy pedicel, furnished with a very short awn arising from a little beneath the apex of the outer palea, perfect. Panicle at first contracted, finally spreading, leaning a little to one side, the lower branches in threes or fives, or semiverticillate, eight to ten inches long. Culm two to three feet high, erect, polished. Sheaths smooth, the upper one much longer than its leaf. Ligule short, obtuse, ragged. Leaves flat, narrow, roughish on the margins and on the inner surface. Root perennial, fibrous, sometimes bulbous. Flowers in May and June. Found in meadows and cultivated grounds. It may be readily distinguished from other grasses by the difference in the length and origin of the awns of the two flowers, viz., the lower one with a *long* awn arising from a little *above the base* of the outer palea, the upper one with a very short awn (which is sometimes obsolete), arising a little *beneath the apex*. The *Arrhenatherum* is very little known in this country or in England, but is much valued on the continent of Europe, for the food of all animals except horses. Its limit of altitude is about 1,500 feet above the level of the sea. It is disputed among botanists whether the bulbous rooted plants form a separate species or not. Mr. Lawson, Prof. Lindley and others, believing that the bulbous roots belong to a different species, while Sir William Hooker, Sir James Smith and Prof. Koch incline to a different opinion. The herbage is very productive, very early and rapid in its growth. When growing with other grasses, cattle and sheep eat it very well, but they do not like to be confined to that alone. The produce of an acre of clayey loam at Woburn was 17,015 pounds, which lost 11,635 pounds in drying, and yielded 664 pounds of nutritive extract. At the time of ripening the seed the produce was 16,335 pounds, which lost 10,617 pounds by drying, and yielded 255 pounds of nutritive matter. The weight of the rowen was 13,612 pounds, which yielded 265 pounds of nutritive matter. It is very liable to rust which affects the whole plant; the root leaves especially are often wholly withered from this cause, but it is rarely attacked by it until after the period of flowering; hence the importance of cutting it early. It sends forth flowering culms during the whole season which accounts for the great

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yield of the rowen. When growing on heathy lands the bulk of the produce is in leaves, but on clayey lands it is in culms. According to the analysis of Mr. Way, it consists of water 72.65; protein 3.54; fat, 0.87; heat producing matters, 11.21; woody fibre, 9.37; ash, 2.36. According to Scheven and Ritthausen it consists of water, 67.0; protein, 3.2; fat, 0.4; heat producing matters, 11.8; woody fibre, 15.4; ash, 2.1. Its seeds weigh from seven to eight pounds per bushel. The bulbous variety above spoken of is very difficult to extirpate from the land. A correspondent of the (English) "Farmers Magazine" for June, 1855, says: "No weed is more troublesome to the farmer than this on the better turnip soils, and on the more loamy clay fallows. The root is perennial, and composed of knobs or bulbs that are joined together at distances by intervening threads, and from each bulb shoots proceed, which circumstance renders the extirpation of the weed exceedingly difficult and tedious. The roots are very tenacious of life, and no degree of arid exposure will destroy the vital principle. Decomposition in a heap, along with other earthy matters, requires to be very minutely inspected at each turning over of the heap; for some roots are very apt to escape on the outside of the compost, and which being carried to the land, will immediately grow, and multiply very fast. Even the burning of the roots in heaps on the field is not thoroughly safe; for the outside may escape ignition, and grow as before. The most effectual method is to carry the roots from the field at once, and to lay them in some waste corner, where they may be burned at leisure." Dogs eat the leaves to excite vomiting in the same manner as they do those of *Triticum repens*. Fig. 178, *Arrhenatherum avenaceum;* Fig. 179, glumes; Fig. 180, the two flowers with the paleæ; Fig. 181, spikelet of the natural size.

52. HOLCUS.—Meadow soft grass; Velvet grass; an ancient name from the Greek *holkos*, draught, from its supposed virtue in drawing out thorns. Spikelets crowded in an open panicle, two flowered, jointed with the pedicels; the boat shaped membranaceous glumes inclosing, and much exceeding the remotish flowers. Lower flower perfect, but its papery or thin coriaceous lower palea awnless and pointless; the upper flower staminate only, otherwise similar, but bearing a stout bent awn below the apex. Stamens three. Styles plumose to the base. Grain free, scarcely grooved.

1. *Holcus lanatus.*—Velvet grass. Yorkshire fog. Meadow soft grass. Spikelets three-sixteenths of an inch long, two-flowered, on short hairy pedicels, crowded closely together, glumes somewhat unequal,

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whitish, the inner one longer and prominently three-nerved, the central nerve as well as the lateral ones clothed with stiff hairs, softer and shorter hairs between the nerves, ovate, tipped at the apex with a mucronate bristle, the outer one lanceolate, acute, without marginal nerves, the central one thickly clothed with long stiff hairs. Paleæ smooth and shining; the lowest staminate flower has its lower palea tipped with a very minute bristle, glossy, rounded on the back, the upper palea entire, linear, somewhat blunt at the apex. The upper flower staminate, linear, keeled, pointed, nerveless on the sides, bearing a curved or hooked awn on the central rib just below the apex; inner palea thin, hyaline, glossy, yellowish pointed. Panicle oblong, one to four inches long, more or less contracted, branches in twos and threes, considerably divided, rough, hairy; culm eighteen inches to three feet high, clothed with a whitish soft down; sheaths downy, loose; ligule short, truncate, toothed at the summit. Upper leaf much shorter than its sheath (only three inches on a culm of three feet long). Lower leaves seven or eight inches long, covered with down. The whole plant is a light green and has an unmistakable velvety appearance. It flowers in June. It grows in moist lands, but also flourishes in dry sandy soils. It abounds on the sands of Nantucket and on the sandy portions of the island of Rhode Island. It is not liked by any animals. From Mr. Way's analysis we learn that it contains of water, 69.70; protein, 3.49; fat, 1.02; heat producing principles, 11.92; woody fibre, 11.94; ash, 1.93. According to Messrs. Scheven and Ritthausen, it contains of water, 75.1; protein, 2.3; fat, 0.5; heat producing principles, 9.5; woody fibre, 10.2; ash, 2.4. From the Woburn experiments we learn that the produce from an acre of clayey loam was 4,764 pounds about the middle of April, which yielded 167 pounds of nutritive matter. At the time of flowering the produce was 19,057 pounds, which lost 12,863 pounds in drying, and yielded 1,191 pounds of nutritive matter. At the time the seeds were ripe the grass weighed 19,057 pounds, which lost 15,246 pounds in drying, and yielded 818 pounds of nutritive matter. The aftermath produced 6,806 pounds of grass, and yielded 372 pounds of nutritive matter. Sir Humphrey Davy showed that its nutritive extract consists exclusively of mucilage and sugar, and that the nutritive extracts of the grasses most liked by cattle have either a saline or a sub-acid taste; since the taste of this extract is very much like that of gum arabic, he suggests that this grass would be more relished by cattle if salt were sprinkled over it. The duke of Bedford made extensive trials of it, but the result showed that it was a very inferior

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grass for pasture or for hay. Its only merit seems to be that it is very easy of cultivation and very productive. The seeds weigh about seven pounds to the bushel, and it has been known to produce eighty bushels of seed to the acre; sixty bushels is quite a common production. Though a late flowering grass its seeds ripen before most others, and being light are easily dispersed by the winds. When once it takes a lodgment in a sandy soil it drives out almost all other species, frequently effecting their banishment in two years. The only way to get rid of it is to enrich the soil, and this when thoroughly done is effectual. Fig. 182, *Holcus lanatus;* Fig. 183, glumes; Fig. 184, flowers and paleæ, enlarged; Fig. 185, spikelet, natural size; Fig. 185*a*, curved awn, much enlarged.

53. HIEROCHLOA.—Holy grass. From the Greek *ieros*, sacred, and *chloa*, grass; because in Prussia it is used in certain religious festivals. Spikelets plainly three flowered, open panicled; the flowers all with two paleæ; the two lower (lateral) flowers staminate only, triandrous, sessile, often awned on the middle of the back or near the tip; the uppermost (middle) one perfect, short pediceled, scarcely as long as the others, diandrous, awnless; glumes equaling or exceeding the spikelets, scarious; paleæ chartaceous. Leaves linear or lanceolate, flat.

1. *Hierochloa borealis.* — Vanilla or Seneca grass. Spikelets broadly ovate, tumid, chesnut colored. Glumes somewhat longer than the flowers, nearly equal, broadly ovate, three-nerved, smooth, acuminate, purplish at the base. Lower palea of the staminate flowers ovate, hairy, roughish on the keel, fringed on the margins, five-nerved. Upper palea rather shorter than the lower one, bifid, minutely fringed on the margins. Perfect flower resembles the lateral ones in texture. Pedicel somewhat hairy. Lower palea smooth on the sides and margin, villous at the tip. Panicle pyramidal, somewhat one-sided, erect, few flowered, three to four inches long. The primary branches in pairs, sometimes solitary; the branches flexuous, smooth. Culm twelve to twenty inches high, erect, nearly simple. The sheaths smooth, the upper one much longer than its leaf. Ligule prominent, lanceolate. Leaves smooth, shining; root leaves long, those of the culm, short, flat. Root creeping. Flowers early in May. Moist meadows. Massachusetts to Wisconsin, chiefly along the coast and on the lakes. It is remarkably sweet scented, and is used often in this country as a scent to put in drawers. In Sweden it is sold to be suspended over beds, as it is said to have a tendency to induce sleep. It is a native of Lapland,

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Norway, Sweden and Russian America. Its odor resembles that of *Anthoxanthum odoratum*, but is more powerful, especially when it is dried. Its seeds rarely mature; not more than two seeds are found in a panicle, and often none, but there are no grasses that propagate themselves more quickly by the root. At Woburn it produced 9,528 pounds of grass, which lost 7,087 in drying, and yielded 632 pounds of nutritive matter at the time of flowering. At the time the seeds were ripe, the produce was 27,255 pounds, which lost 17,696 pounds by drying, and yielded 2,233 pounds of nutritive matter.

Although this is one of the earliest of the grasses, the culms starting before the leaves are developed, it is later in the season before they attain their full size. Mr. Sinclair has never seen an instance where this grass has been cropped by hares or rabbits. Sir Humphrey Davy has shown that eighty-two parts of the nutritive matter of this grass consist of seventy-two parts of mucilage or starch, four parts saccharine matter and six parts of bitter extractive matter, and a peculiar substance which has an acrid taste, more soluble in alcohol than in water. Fig. 186, *Hierochloa borealis;* Fig. 187, glumes; Fig. 188, paleæ; both enlarged; Fig. 189, spikelet, natural size; Fig. 189*a*, ovary, squamulae, stamens and pistils.

2. *Hierochloa alpina.*—Spikelets about three-sixteenths of an inch long, compressed, brownish with a tinge of purple, glossy. Glumes broadly ovate-lanceolate, thin, glossy, apparently nerveless, with curved transverse markings, somewhat unequal, the inner longest; scarious margined at the apex, thin and membranaceous. The perfect upper or middle flower is awnless, but the lower palea is mucronate at the apex, with a few stiff hairs standing on the central rib below the mucronate point, five-nerved; inner palea nearly equal, linear. The awn of the lower staminate flower is longer than the palea. The awn of the upper staminate flower is shorter than the palea; the lower paleæ of both flowers are bluntish and eroded at the summit, hairy on the margins, five-nerved, brownish; upper palea linear, acute, bifid, hairy at the apex. The paleæ in all the specimens in our collection are pierced as if by insects, and not one of them has a perfect seed. Panicle contracted, one to two inches long, the branches smooth, mostly single or in pairs; each principal branch bifurcates, having a spikelet at each extremity. Culms six to twelve inches long, bearing two or three leaves. Sheaths loose, smooth. Ligule very insignificant, short. Lower leaves numerous, five or six inches long, one-eighth of an inch wide, smooth, involute;

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the upper leaf spear-shaped, about three quarters of an inch long. Anthers linear. Flowers about the last of June. Mountain tops of New England and New York. It can be readily distinguished from No. 1 by its short panicle and awned paleæ of the staminate flowers.

54. ANTHOXANTHUM.—Sweet scented vernal grass. Name from the Greek *anthos*, a flower, and *xanthos*, yellow. Spikelets spiked-panicled, three-flowered; but the lateral flowers neutral, consisting of one palea, which is hairy on one side and awned on the back; the central (terminal) flower perfect, of two awnless chartaceous paleæ, two-androus; glumes very thin, acute keeled, the upper about as long as the flowers, twice the length of the lower. Squamulæ none. Grain ovate, adhering to the inclosing paleæ.

1. *Anthoxanthum odoratum.*—Spikelets as in the generic description, on short hairy pedicels; glumes very unequal, the upper one sharp pointed, as long as the flower, three-nerved, the lower one not half as long; both awn pointed, very thin and delicate, hyaline, with long hairs on their central nerves. The palea of one of the lateral (imperfect) flowers has a geniculate awn arising from the base, the awn of the other rises from near the apex, which is shorter than the other and straight. The palea with the bent awn is thickly covered with short hairs, reddish, and without nerves that are visible. The palea with the straight awn is less hairy, and has five indistinct nerves; the paleæ of the perfect flower thinner, shorter, and without hairs. Panicle very close and has the appearance of being spiked except in shady places, when the lower branches loosen and expand one and one-half to three inches long; branches single, about one-eighth of an inch long, hairy. Culm twelve to eighteen inches high ordinarily, but we have measured it when it was two feet four inches long, and have been assured by credible farmers that they have seen it three feet long, smooth, bearing two or three leaves. Sheaths long, roughish when felt from below upward, sometimes hairy. Leaves short, the upper ones from three-fourths to two inches long, the lowest three or four inches long and one-eighth of an inch wide, more or less hairy. Ligule long, acute; seed oblong, black and shining. Flowers from May to July. It is found in meadows and woods, in very dry soils, but comes to its greatest perfection in those that are deep and moist. In some of the meadows about Northampton, on the Connecticut river, it constitutes the main bulk of the grass. It is mowed twice in the year, and we have seen the second crop average eighteen inches in length. It is nowhere considered a very valuable variety for hay, as the culms are wide apart, very thin,

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and bear but few leaves; hence it gives a light crop of hay. We have never seen over three-quarters of a ton of hay from an acre. The seeds are not very abundant nor easy of acquisition. In damp, rainy seasons they become diseased, and in this condition are worthless. They weigh five or six pounds to the bushel. Mr. Grant, of England, laid down a field of considerable extent, one-half of which was sown with this grass and white clover; the other half with meadow foxtail and red clover. The sheep would not touch the vernal grass and white clover, but kept constantly on the foxtail and red clover, though the dwarfish nature of the vernal grass had occasioned an unusual luxuriance of the white clover, with which it was associated. Its scent is most delightful. A few stalks squeezed in the warm hands for a little while develope a very powerful odor, resembling that of *gum benzoin*, and it was used for making a fragrant distilled water fifty or sixty years ago. It gives the flavor to hay which is so much admired. It has been thought to give a sweet flavor to butter and to mutton, but these notions are now exploded. Neither sheep nor cows will touch it voluntarily, except that they will feed in early spring on the root leaves, which contain very little of the odor. It is very possible that a very *slight* admixture of it may be beneficial medically, as cattle will then eat it with a relish; but when in any considerable bulk they always refuse it. Mr. Flint calls attention to a very curious provision of nature for the protection of the seeds "by which they are prevented from germinating in wet weather after approaching maturity, and thus becoming abortive, the husks of the blossom adhering to the seed when ripe, and the jointed awn, by its spiral contortions, when affected by the alternate moisture and dryness of the atmosphere, act like levers to separate and lift it out of the calyx even before the grass is bent or lodged, and while the spike is still erect. If the hand is moistened and the seeds placed in it, they will appear to move like insects from the uncoiling of the spiral twist of the awns attached to them." The best trait in the character of this grass is its early start in the spring, and its hardy and enduring character. Mr. Way gives the following account of its composition: Water, 80.35; protein, 2.05; fat, 0.67; heat producing principles, 8.54; woody fibre, 7.15; ashes, 1.24. Messrs. Scheven and Ritthausen give: Water, 72.0; protein, 2.1; fat, 0.8; heat producing principles, 11.2; woody fibre, 12.3; ashes, 1.6. In the Woburn experiments on a brown, sandy loam, well manured, the produce of an acre was at the time of flowering, 7,827 pounds, which lost 5,723 pounds in drying and gave 122 pounds of nutritive matter. At the time the

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seed was ripe the produce per acre was 6,125 pounds, which lost 4,287 pounds in drying, and yielded 311 pounds of nutritive matter. The produce of the aftermath was 6,806 pounds, which yielded 239 pounds of nutritive matter. One hundred pounds of grass cut in the flower therefore gives 26.9 pounds of dry hay and 1.5 pounds of nutriment; and 100 pounds of grass, when the seed is ripe, gives thirty pounds of dry hay and 5.0 pounds of nutriment. Timothy gives, when cut in flower, 42.5 pounds of dry hay for 100 pounds of grass and 3.9 pounds of nutriment; and when the seeds are ripe, 100 pounds of grass yield 47.5 pounds dry hay and 8.9 pounds of nutriment. Considered, therefore, with reference to the amount of nutriment, if 100 pounds of timothy hay, cut when in flower, is worth one dollar, 100 pounds of vernal grass is worth but thirty-eight cents; or when cut at the time of ripening the seed, if timothy, is worth one dollar per 100 pounds, vernal grass is worth fifty-six cents. It also appears that the absolute weight of grass on an acre of timothy is five times as great as that on an acre of vernal grass. If these experiments are correct, it would seem to follow that a single acre of timothy is worth as much to a farmer as ten or fifteen acres of vernal grass. We are by no means sure, however, that the Woburn experiments are reliable. They need very much to be repeated with all the precautions suggested by modern science. Fig. 190, *Anthoxanthum odoratum;* Fig. 191, glumes; Fig. 192, paleæ; both enlarged; Fig. 193, spikelet, natural size; Fig. 193*a*, ovary and pistils. The following measurements are from a specimen somewhat above the average size: Culm thirty inches high. Panicle two and a half inches long. Distance from top of first leaf to base of panicle, three and one-fourth inches. The upper leaf is three-fourths of an inch long and one-eighth of an inch wide. The ligule is three thirty-seconds of an inch long and irregularly toothed at the top. Second leaf (downward) one and three-fourths inches long, three-sixteenths of an inch wide. There are a few hairs at the throat of each sheath. Third leaf, two and three-fourths inches long, three-sixteenths of an inch wide. Fourth leaf, three and a half inches long. Fifth leaf, three and one-fourth inches long, one-eighth of an inch wide. Lower branch of panicle, one-eighth of an inch long. From lowest branch to next upper one, one-half inch. Spikelets, one-fourth of an inch long.

55. Phalaris. — Canary grass. Name from the Greek *phalos*, shining, in allusion to the polished paleæ. Spikelets crowded in a dense or spiked panicle, with two neutral, mere rudiments of flowers, one on each side at the base of the perfect one, which is flattish, awn-

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less, of two shining paleæ, shorter than the equal, boat-shaped, and often wing keeled glumes, finally coriaceous or cartilaginous, and closely inclosing the flattened, free and smooth grain. Stamens three. Leaves broad, flat.

1. *Phalaris arundinacea.*—Spikelets about one-fourth of an inch long, on short, geniculate, rough pedicels, crowded thickly on the branch. Glumes equal, obtuse, the central rib produced into an awn-like point; the outer five-nerved; the inner three-nerved; roughish on the keel. The neutral flowers are not observed at first; but on carefully examining the base of the palea, two short, hairy lines will be seen, which, when carefully-detached, are found to consist of two glume-like bodies, which are the neutral flowers, one-third the length of the fertile palea. The lower palea a little shorter than the glumes, with a few hairs on the surface, ovate; the upper palea lanceolate. Anthers linear, yellow. Seeds oblong, black. Panicle two to four inches long, oblong, spreading a little at maturity; branches flowered almost to the base, rough, as is the rachis. Culm erect, two to four feet high, smooth, bearing five or six leaves; upper sheath much longer than its leaf, with a long decurrent ligule. Ligules on the lower sheaths more obtuse. Leaves four-sixteenths to five-sixteenths of an inch wide and seven to eight inches long; the upper one from one to two inches long, rough, especially on the edges. Flowers in July. Swamps and wet borders of streams. The well known ribbon grass of the gardens is this grass transplanted into a good dry soil. The ribbon grass of the gardens can, in like manner, be reconverted into the original grass by transplanting it on a marsh or river bank. Its roots interlace very closely, and after a few years swamps are so completely covered with them as to bear a waggon and horses without breaking through. It is also very useful in protecting river banks, but in narrow brooks it is apt to fill up the channel and thus convert a large area into swamps. Its flowers vary greatly in their hue according to position. Their general color is whitish or pale green, but they are met with when they exhibit rich shades of purple and yellow, and with red instead of yellow anthers. The rudimentary flowers on either side of the fertile paleæ are not invariably to be met with. We have seen flowers that have had only one of these, and sometimes neither is present. Its seeds weigh from forty-eight to fifty pounds to the bushel, and the birds are very fond of them. Half a bushel of them to the acre is quite enough to sow under any circumstances, but it is most commonly propagated from cuttings of the root, one piece being deposited to every square foot, in the early

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spring, in ground that has been well prepared and pulverized by frost. Linnæus says that it is extensively used for fodder in Sweden and is liked by the cattle. In the province of Scania it is mown twice a year. The peasantry there use it as a thatch for their cottages and hay stacks, and find it more durable than straw. It is very certain that cattle in our own country do not relish it either as pasture or hay, and they will not touch it so long as they can get anything better. It might, however, be utilized even here by the proprietors of marsh lands. When cut very young, say when about one foot high, and used for soiling, cattle eat it better than in any other way. When it becomes older it is very rigid and becomes distasteful, and should never be used as fodder. The creeping roots are probably nutritious; they have a sweetish flavor, and pigs will devour them with avidity. Its composition, as stated by Messrs. Scheven and Ritthausen, is: Water, 68.9; protein, 1.9; fat, 0.4; heat producing principles, 12.6; woody fibre, 13.5; ashes, 2.6. According to the Woburn experiments, a black sandy loam incumbent on clay at the time of flowering yielded from an acre 27,225 pounds of grass, which lost 14,973 pounds in drying, and afforded 1,701 pounds of nutritive matter. From a strong, tenacious clay the produce was 34,031 pounds of grass, which lost 17,015 in drying, and afforded 2,126 pounds of nutritive matter. If these experiments are trustworthy, it seems that a clay soil produces 4,764 pounds more of dry hay to the acre than a black sandy loam, and that 100 pounds of grass from it affords 6.3 pounds more of nutritive matter. If it is chemically true that this grass yields so much more nutriment than timothy, redtop, fescue and other favorite grasses, it is equally true that the stomachs of cattle are not so organized that they can extract it, and that it will not lay on anything like as much flesh nor give as liberal a flow of milk. Fig. 194, *Phalaris arundinacea;* Fig. 195, glumes; Fig. 196, paleæ and rudimentary flowers; both enlarged; Fig. 197, spikelet, natural size.

2. *Phalaris Canariensis.*—Spikelets from five-sixteenths to six-sixteenths of an inch long, oval, compressed closely, imbricated and beautifully variegated with green and white, as shown in the illustration (Fig. 198), where the dark part represents the green shades. Glumes flattened, ovate, unequally distributed about the central rib, about twice as long as the paleæ, clothed with short appressed hairs, nerves with greenish margins. Rudimentary flowers half the length of the perfect one, smooth below, slightly hairy at the apex. Paleæ of the perfect flower ovate lanceolate, hairy; the lower one obscurely

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five-nerved. Panicle spike-like, with very short branches about one-seventh of the length of the spikelets, oval, compact. Culm eight to eighteen inches high, bearing three or four leaves. Sheaths inflated, somewhat roughish. Ligule acute, the upper one pointed. Leaves from one-fourth to three-eighths wide, one to three inches long, pale green, glaucous. Seed ovate, invested with the hardened palea. Flowers in July. A native of the Canary Islands. Waste places and door yards. Sparingly cultivated for the sake of the seed, which is now considered the best known food for the canary bird, and large amounts are sold for that use. From its general appearance no one would suppose it to belong to the same species as the preceding, but the alliance is predicated on the similarity of the flowers alone. Cattle are very fond of it when it is young, but the yield is too small to make it valuable as a forage crop. It produces from thirty to forty bushels of seed to the acre. We have no analysis of it whatever. Annual. Fig. 198, *Phalaris Canariensis;* Fig. 199, glumes enlarged; Fig. 200, paleæ and rudimentary flowers enlarged; Fig. 200*a*, glumes natural size.

56. MILIUM.—Millet grass. Named from the Latin word *mille*, a thousand, because of its fertility. Spikelets diffusely panicled, not jointed, with their pedicels apparently consisting of two equal membranaceous convex and awnless glumes, including a single coriaceous awnless flower; but, theoretically, the lower glume is wanting, while an empty single palea of the lower (neutral) flower, resembling the upper glume, fulfills its office, and stands opposite the narrow palea of the terete fertile flower. Stamens three. Stigmas branched-plumose. Grain not grooved, inclosed in the palea, all deciduous together.

1. *Milium effusum.*—Glumes ovate, roughish, obscurely three-nerved. Paleæ nearly equal, rather acute. The outer one smooth, membranaceous, glossy, without nerves or keel. Inner one with margins entire. Culm three to six feet high, erect, simple, smooth, bearing five or six leaves with smooth sheaths. Ligule oblong. Leaves eight to twelve inches long, and nearly half an inch wide, thin, flat, glossy. Panicle six to ten inches long, spreading, the lower branches clustered, the upper ones opposite, long. Flowers in July and June. Mountain meadows and borders of streams. Cold woods. It thrives when transplanted to open and exposed situations. It is one of the most beautiful of the grasses; the panicle is often a foot long, and the branches are so exceedingly delicate that the small glossy spikelets seem to be suspended in the air. Birds are very fond of the seed. Mr. Colman says that he has raised three tons to the

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acre, of as good nutritious hay as could be grown, from it, when sown in May. The plants multiply by the root as well as by the seed, sending out horizontal shoots of considerable length, in some habitats, which root at the joints as they extend. The Woburn experiments show that on a light sandy soil, at the time of flowering, the produce of grass from an acre is 7,857 pounds, which lost 4,794 pounds in drying, and gave 214 pounds of nutritive extract.

57. Amphicarpum.—Name from the Greek *amphikarpos*, doubly fruit bearing. Spikelets jointed with the apex of the pedicels, apparently one-flowered, of two kinds; one kind in a strict terminal panicle, like those of *Milium*, except that the rudiment of the lower glume is ordinarily discernible, quite deciduous from the joint, commonly without ripening fruit, although the flower is perfect; the other kind solitary at the extremity of slender runner-like radical peduncles (which are more or less sheathed toward the base), much larger than the others, perfect and fertile, subterranean, the enwrapping glume and similar empty palea many nerved. Flower oblong or ovoid, pointed. Stamens three (small in the radical flowers). Stigmas plumose, deep purple. Grain ovoid, terete, not grooved, in the radical flowers very large (two to three lines long), the embryc next the lower palea. Neutral palea somewhat exceeding the glume and the fertile flower. Leaves lanceolate, flat, copious on the lower part of the culm, clothed like the sheaths with spreading bristly hairs.

1. *Amphicarpum Purshii.*—Moist, sandy pine barrens, New Jersey. Flowers in September. Gray. Fig. 203*a*, an enlarged spikelet; Fig. 203*b*, the same with the parts displayed; Fig. 203*c*, a radical (fertile) spikelet enlarged.

58. Paspalum.—Spikelets spiked, or somewhat racemed in two to four rows on one side of a flattened or filiform continuous rachis, jointed with their very short pedicels, plano-convex; awnless, apparently only one-flowered, as in *Milium;* but, on the other hand, differing from *Panicum* merely in the want of the lower glume; which, however, is occasionally present in some species as a small scale. Glume and empty palea few nerved. Flower coriaceous, mostly orbicular or ovate, flat on the inner side, convex on the outer. Stamens three.

1. *Paspalum fluitans.*—Glabrous (*i. e.*, smooth, having no hairs, bristles or other pubescence), stems procumbent below, and rooting in the mud or floating; spikes very numerous in a spiked raceme; their thin and membranaceous or foliaceous rachis broader than the spike-

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lets, and keeled or boat shaped; leaves lanceolate; rachis one line wide projecting beyond the small slightly pubescent spikelets into a tapering point; scabrous on the back. River swamps, Virginia, South Ohio, Illinois, and southward. October. Gray.

2. *Paspalum setaceum.*—Spikelets obtuse and well rounded, very narrow; two on a short-forked pedicel very closely appressed to the rachis, about one-sixteenth of an inch in length. Glume of the neuter flower ovate, orbicular; the paleæ similarly shaped. The perfect flower as long as the glume, and very glossy. The spikes are sometimes single, but more frequently there are two, one of them on a long, the other on a short peduncle, from the same sheath; the peduncle of the terminal spike is from two to six inches long, arising from the uppermost sheath. There are generally two spikes arising from the uppermost leaves, one of which is hardly exserted. Rachis convex on the back, and hairy at the base. Culm erect or decumbent, but mostly prostrate, from one to two feet long, smooth. Leaves about one-eighth of an inch wide, commonly very hairy, especially on the margins; the sheaths are also well covered with spreading hairs. It is usually found in sandy fields, from Massachusetts to Illinois and southward. Flowers in August.

3. *Paspalum lævе.*—Spikelets much as in No. 2, but larger, one on each pedicel. Glume and palea of the neuter flower one-nerved, even. Paleæ of the perfect flower minutely dotted in lines. Spikes numbering from three to six, alternate, spreading horizontally, having a bearded tuft at the base; rachis flexuous, flat on the back; culms erect, smooth, stout, one to three feet high, simple; sheaths flattened, smooth or hairy; leaves one-half inch wide, deep green, hairy at the base, long. Perennial. Flowers in August. Moist banks and meadows from New England, Long Island to Kentucky, and southward. It is very variable with respect to pubescence. Fig. 203*d*, is the inflorescence of *P. lævе;* Fig. 203*e*, a closed spikelet enlarged; Fig. 203*f*, the same with the parts displayed.

4. *Paspalum distichum.*—Joint grass. Spikelets acute, ovate, somewhat pointed, one and one-half lines long. Spikes three-fourths to two inches long; always a pair at the summit of the naked peduncle, short and closely flowered, one short peduncled, the other sessile; rachis flat on the back; culms ascending (about one foot high) from a long creeping base. Leaves linear lanceolate, two to three inches long, nearly glabrous, rather glaucous. Wet fields, Virginia and southward. July to September. Perennial. Gray.

5. *Paspalum Digitaria.*—Culms ascending, one to two and

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one-half feet high, from a creeping base; leaves lanceolate, three to six inches long, one-third to one-half inch wide; spikes slender and rather sparsely flowered, one to four inches long, conjugate (*i. e.*, coupled, in single pairs), both sessile at the apex of the slender peduncle; spikelets ovate lanceolate, two lines long. Virginia and southward.

We are only acquainted with Nos. 2 and 3; the descriptions of the other species are copied from Prof. Gray's manual. Nos. 2 and 3 are of no value in agriculture; and as we find little said of the others in any work accessible, we conclude that the whole genus is equally useless to the farmer.

59. PANICUM.—Panic grass. From the Latin *panis*, bread; some species of this genus having been used for food. Spikelets panicled, racemed, or sometimes spiked, not involucrate, one and one-half to two-flowered; glumes two, but the lower one usually short or minute (rarely wanting), membranaceo-herbaceous; the upper as long as the fertile flower; lower flower either neutral or staminate, of one palea, which closely resembles the upper glume, and sometimes with a second thin one; upper flower perfect, closed, coriaceous or cartilaginous, usually flattish, parallel with the glumes, awnless, inclosing the free and grooveless grain. Stamens three. Stigmas plumose, usually purple.

1. *Panicum filiforme.*—Slender crab grass. Spikelets crowded two or three together, about one-sixteenth of an inch long, pedicillate, oblong, acute; upper glume equaling the flower; the lower one very minute or wholly wanting. The lower flower consists of a single palea and is neutral; the perfect flower has paleæ that are *striate* (*i. e.*, marked with longitudinal grooves), and are nearly black when fully matured. The spikes usually are two in number, but sometimes there are four; they are very delicate and thread-like, alternate and near to each other, about one or two inches long, erect. Culms very slender, one to two feet high, erect, smooth; upper sheaths smooth, the lower ones with fine spreading hairs scattered over them. The leaves are from one to two inches long, smooth on the under side, but not unfrequently hairy on the upper side. Flowers in August. It is common on dry, sandy soils from Massachusetts to New Jersey, along the coast, Illinois and southward. Annual. Fig. 204, *P. filiforme;* Fig. 205, pair of spikelets enlarged; Fig. 206, glume and paleæ.

2. *Panicum glabrum.*—Spikelets ovoid, crowded, about one line long. The upper glume about as long as the abortive flower; the lower

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one very minute, and will be overlooked without close examination. The palea of the abortive flower is five-nerved and hairy. Palea of the perfect flower five-nerved, smooth and orbicular. Spikes digitate and diverging, three or four in number. Culm eight to twelve inches long, decumbent, rarely rooting at the joints, smooth. Leaves occasionally hairy on the upper surface. Flowers in August and September. Sandy fields and waste places. It may be most easily distinguished from the preceding by its spreading spikes, its flat rachis, and its decumbent culm; whereas, *P. filiforme* has erect spikes, a filiform rachis and an erect culm.

3. *Panicum sanguinale.*—Common crab grass. Finger grass. Spikelets about one-eighth of an inch long, arranged in pairs in two rows on the same side of the rachis, the lower flower of the pair almost sessile, the upper on a peduncle a little longer than the spikelet; peduncles flat, striate, rough on the margins. Glumes very unequal, the upper one three-nerved, lanceolate, acute, rough on the margin; the lower one minute, about one-fourth of the length of the upper, nerved, hairy on the margins. The lower abortive flower has no upper palea; the lower one nerved, pubescent on the margins; the upper perfect flower of two paleæ of nearly equal length, smooth, frequently tinged with purple on one side. Spikes two to three and one-half inches long, digitate, spreading, four to ten in number. Rachis flexuous, flat, divided in the middle. Culm one to two feet high, decumbent at the base, then ascending; branching at the base and rooting at the lower joints, bearing about four leaves. Sheaths more or less hairy, the upper one much longer than its leaf. Ligule prominent, rounded, hairy at the base. Leaves generally undulate on the margin, hairy, the hairs having their roots in small tubercles. Filaments rather longer than the flowers, short, violet-colored, cloven at each extremity; seeds hard and polished. Common in cultivated and waste grounds, and a troublesome weed in yards and gardens. Flowers from August to October. It is a very common, and very troublesome weed in warm climates where it abounds. According to the Woburn experiments, it yields 6,806 pounds of grass, which loses 4,258 pounds by drying, and yields 119 pounds of nutritive extract. This was from a sandy soil, and at the time of flowering. It is strictly an annual plant. Mr. Sinclair says that it produces much seed, of which birds are very fond, and requires to be protected by nets, or otherwise, during the time of ripening. The smaller birds pick out the ripe seed, even when only a small quantity is found among the blossoms. Schreber informs us, the seeds are not only

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collected from this grass, which is cultivated in some parts of Germany for the purpose, but likewise from the *Festuca fluitans*, float fescue. The common method of collecting and preparing them, is this: At sunrise they are gathered, or beaten into a hair sieve from the dewy grass; are spread on a sheet and dried for a fortnight in the sun; they are then gently beaten with a wooden pestle in a wooden trough or mortar, with straw laid between the seeds and the pestle till the chaff comes off; they are then winnowed. After this, they are again put into the trough or mortar, in rows, with dried marigold flowers, apple and hazel leaves, and pounded until they appear bright; they are then winnowed again, and being made perfectly clean by this last process, they are fit for use. The marigold leaves are added to give the seeds a finer color. A bushel of seed with the chaff, yields only about two quarts of clean seed. When boiled with milk or wine, it forms an extremely palatable food, and is in general, made use of whole, in the manner of sago, to which it is in most instances preferred. It is said to have received the name *sanguinale*, not from its color, but from a mischievous trick of boys in Germany, thursting the spikelets up the noses of their companions, thereby making them bleed. Fig. 207, *Panicum sanguinale;* Fig. 208, spikelets and rachis; Fig. 209, spikelet, showing upper glume; Fig. 210, two glumes and two florets; Fig. 211, uppermost floret, showing upper and lower paleæ; Fig. 212, ligule of upper sheath, showing hairs at the base; Fig. 212*a*, ovary, stamens and pistils.

4. *Panicum anceps.*—Spikelets scattered, pointed, lanceolate, somewhat curved, small, about one line long, short pediceled. Glumes seven-nerved. The neutral flower one-third longer than the perfect one, and consists of two paleæ; it is fully twice the length of the lower glume. Panicle elongated and racemose, virgate or pyramidal, contracted. Culm flat, two to four feet high, upright. Leaves broadly linear. Perennial. Flowers in August. Wet soil, pine barrens of New Jersey and southward.

5. *Panicum agrostoides.*—Spikelets racemose, ovoid-oblong, crowded and one sided, acute, appressed, three-fourths of a line long, mostly purplish, smooth. Lower glume about half the length of the upper, very acute. Upper glume longer than the neuter flower, five-nerved; neuter lower flower exceeds the perfect one, of two nearly equal paleæ, the upper one herbaceous, acute. Paleæ of the perfect flower slightly bearded at the apex. Panicle terminal and lateral, spreading, from four to eight inches long. Branches some-

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what flexuous, mostly in pairs, finally horizontal. Culm two to three feet high, compressed, smooth. Leaves long, forming a tuft at the base of the culm, two to four lines wide. Ligule short, obliquely truncate. Flowers in July and August. Found in wet meadows from Massachusetts to Virginia, Illinois and southward, very common near the city of New York. Fig. 213, *Panicum agrostoides;* Fig. 214, spikelet; Fig. 215, neutral flower; Fig. 216, perfect flower; Fig. 217, transverse section.

6. *Panicum proliferum.*—Spikelets somewhat racemose on the branchlets, appressed, lance-oval, acute, pale green. Lower glume broad, one-third to one-fourth the length of the upper one, somewhat obtuse; the upper one acute; seven-nerved. The neutral flower consists of a single palea. Perfect flower shorter than the abortive one and shorter than the glumes, acute, smooth. Panicles terminal and lateral, pyramidal, compound, large, the primary branches at length spreading, the branches much divided, straight and capillary. Culms two to three feet high, ascending from a procumbent branching base, geniculate, thick and succulent; sheaths flattened, hairy at the throat. Ligule hairy. Leaves eight to fourteen inches long and half an inch wide. All parts of the plant smooth; anthers orange colored. Flowers in August and September. It is found on the brackish marshes and meadows, particularly in sandy soils; but is sometimes met with in soils that are not brackish. Cattle seem fonder of this species than they are of any other in the genus.

7. *Panicum capillare.*—Spikelets about one-eighth of an inch long, ovate acuminate, and may perhaps be most correctly described as diamond shaped, on capillary rough pedicels from half an inch to an inch long. Glumes purplish, pointed; the upper one as long as the abortive flower, three-nerved; the lower one broadly ovate, sharp pointed, three-nerved, about one-third the length of the upper one. There is no trace of an upper palea in the abortive flower; the lower palea herbaceous, five-nerved. Perfect flower much shorter than the imperfect one, ovoid, obtuse, plano-convex, smooth, shining. Panicle very loose, composed of a multitude of very rough capillary compound branches, seven or eight inches long; at first erect, then spreading, and finally *divaricate* (*i. e.*, spreading so as to form *more* than a right angle with the stem above). Culm erect, one or two feet high, often branching at the base with lateral panicles. Sheaths clothed with long hairs, which spring from minute tubercles. Ligule very short, hairy. Leaves seven to nine inches long, three-eighths to one-half an inch wide, hairy, hairs three-sixteenths of an inch long

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on the margins of the lower part, sometimes tinged with purple. Flowers in August and September. Sandy soils and cultivated fields, especially in cornfields late in the season. When it grows in dry woods it is much dwarfed; it is more slender and the leaves are much narrower. As Dr. Darlington remarks, late in the autumn the dry culms break off, and the divaricate panicles are rolled over the fields by the winds until they accumulate in great quantities along fences and ledges. It is really a great nuisance in cornfields as it robs the ripening corn of much nutriment. It is known to farmers as "hair stalked panic grass" and "old-witch grass." Fig. 217*a*, spikelet opened (enlarged).

8. *Panicum autumnale.*—We have never seen this grass except in herbariums, and therefore copy the description of it from Prof. Gray. Culm ascending, very slender, one foot high, branching below; leaves small, one to two inches long, linear-lanceolate, and upper sheaths glabrous. Panicle as in depauperate states of the last, but glabrous, except the strongly bearded main axils; its capillary much elongated divisions mostly simple and bearing solitary spindle-shaped spikelets; lower glume minute; perfect flower narrowly oblong or lance oblong, acute, nearly equaling the lance oblong, obtuseish, upper glume and the neutral palea. This well marked species is either rare or has been generally overlooked. Sand hills, Mason county, Illinois, and southward.

9. *Panicum virgatum.*—Spikelets about one-eighth of an inch long, scattered, linear pointed, on smooth, flexuous pedicels, from three-sixteenths to five-sixteenths of an inch long. Glumes acuminate, often purplish; the lower one about half the length of the upper. The lower flower staminate with two nearly equal paleæ rather exceeding the lower glume, acuminate; stamens purple, large. Perfect flower very smooth, stigmas purple. Panicle ten to eighteen inches long; branches closely appressed at first, finally spreading, rough, in whorls of eight or nine, whorls remote; on the upper part of the panicle the branches are fewer. Culm three to five feet high; sheaths loose, deeply striate, smooth. Ligule short, lacerate, hairy; upper leaf much longer than the panicle, and longer than its sheath, fifteen inches to two feet long, rough on the margins, flat, of a yellowish tinge when old. Flowers in August. Wet, sandy banks, and islands, especially near salt water; but is sometimes found in dryer soils. Dr. Torrey remarks that this species beautifully illustrates the true structure of the flowers in PANICUM and other allied genera. The lower flower of the spikelet, instead of being rudimentary or very imper-

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fect, is here well developed, being furnished with two nearly equal paleæ and three perfect stamens; the inferior glume also is larger than usual in this genus. Perennial. Fig. 217*c*, a spikelet magnified; Fig. 217*d*, the same displayed; the lower flower of two palets and staminate.

10. *Panicum amarum.*—Nearly smooth, rigid; culms one and a half feet high, sheathed to the top; leaves involute, glaucous, coriaceous, the uppermost exceeding the constricted panicle, the simple racemose branches of which are appressed, very smooth. Spikelets ovate pointed (pale); lower glume little shorter than the sterile flower. Perennial. Flowers in August and September. Sandy shores, Connecticut, Virginia and southward. Prof. Gray.

11. *Panicum latifolium.*—Spikelets from two to three-sixteenths of an inch long, obovate, on pedicels varying from one to four-sixteenths of an inch long; lower glume loose, broad at the base, pointed, rather less than half of the length of the upper one, obscurely nerved, upper one strongly five to seven-nerved, about as long as the fertile flower, obtuse at the apex; lower flower sterile, generally with three stamens, but not invariably so; outer palea herbaceous, obtuse at the apex, seven-nerved, inner palea linear, hyaline, a little shorter than the outer palea of the fertile flower, coriaceous, shining. Panicle two to four inches long, lozenge shaped, spreading, terminal, somewhat exserted, semi-verticillate, three or four branches in the lower group of branches, diminishing higher; branches flexuous, a little rough, bearing few spikelets; sheaths sometimes smooth, but generally more or less hairy. Ligule wanting, but generally replaced by a few long hairs; leaves broadly oblong, lanceolate, cordate and clasping at the base, four to five inches long, having about eleven principal nerves, with about five subordinate ones between them, ciliate on the margins, especially at the base, more or less pubescent on both surfaces, flat. Culm one to two feet high, bearing four or five leaves, the upper one exceeding the panicle. Flowers from June to August. Frequent in moist thickets.

12. *Panicum clandestinum.*—Spikelets ovoid, pubescent; glumes rather acute; the lower flower neuter, with two paleæ; the inferior palea resembling the glumes; upper palea membranaceous, obtuse, about two-thirds of the length of the lower one. The perfect flower with three stamens and purple anthers; the paleæ ovoid, shining; culm one to three feet high, with short axillary branches, erect, rigid, very leafy to the top, with appressed branches; sheaths with very stiff hairs, which arise from papillæ situated

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between the nerves; leaves much as in No. 11, but longer; panicles lateral and terminal, both more or less inclosed in the sheaths, few flowered. Flowers in July and August. Moist thickets and river banks. Common. Fig. 217*e*, a spikelet of *P. clandestinum;* Fig. 217*f*, the same displayed.

13. *Panicum microcarpon.*—Culm and sheaths as No. 11; the broadly lanceolate leaves nearly similar, but longer in proportion and less pointed; not dilated at the rounded bristly ciliate base, very rough margined, the upper surface roughish; panicle soon exserted on a slender peduncle, very many flowered, narrowly oblong, three to seven inches long; spikelets about half a line long, ovoid, smooth or smoothish; lower glume orbicular and very small. Perennial. July to September. Pennsylvania and Michigan, to Illinois and southward. Prof. Gray.

14. *Panicum xanthophysum.*—Spikelets obovate, globose, a little short of one-eighth of an inch long, pubescent. Lower glume about one-third of the length of the upper, acute, ovate, covered with minute hairs; upper one obtuse, nine-nerved, herbaceous; lower flower of two paleæ sometimes staminate, longer than the membranaceous upper one; the perfect flower cartilaginous, whitish, shining, as long as the upper glume; the upper palea inwrapped by the curled margins of the lower one; panicle nearly simple, on a long naked peduncle, which is very slender, few flowered, contracted; branches roughish, erect; culm simple at first, at length branching at the base, twelve to fifteen inches high, smooth, bearing four or five leaves; sheaths hairy; leaves five or six inches long and about one-half an inch wide, very acute, clasping at the base, strongly nerved; the ciliate base hairy, otherwise smooth. The plant is of a light green color, and becomes yellowish in drying. Flowers in June. Found in dry and sandy soil, from Maine to Wisconsin and northward. Fig. 218, *P. xanthophysum;* Fig. 219, spikelet enlarged, front view; Fig. 220, the same, back view; Fig. 221, perfect flower of the same; Fig. 222, same, with paleæ removed.

15. *Panicum viscidum.*—Culms upright or ascending, at length much branched, leafy to the top; densely velvety-downy all over, as also the sheaths, with reflexed, soft, and often clammy hairs, except a ring below each joint; leaves likewise velvety all over, lanceolate (one-half inch wide), eleven to thirteen-nerved; panicles spreading, the lateral ones included; spikelets obovate, one to one and one-half lines long, downy; the roundish lower glume scarcely one-fourth the length of the seven-nerved upper one. Flowers in August. Damp

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soil, Southern New Jersey to Virginia and southward. Prof. Gray.

16. *Panicum pauciflorum.*—Culms upright, at length much branched and reclining, one to two feet long, roughish; leaves lanceolate, three to five inches long by one-third to one-half of an inch wide, rather faintly nine-nerved, hairy or smooth, fringed on the whole margin or next the base with long and stiff spreading hairs; the sheaths bristly throughout with similar hairs. Panicle open, nearly simple, bearing few, tumid-obovate, hairy or smoothish spikelets about one and a half lines long; lower glume roundish, about half or a quarter of the length of the upper one. Flowers in June and July. Found in wet meadows and copses, western New York to Wisconsin, and southward. Distinguished by its much larger spikelets, more nerved leaves and coarser aspect from any form of the next. It has probably been described under several names, some of them earlier than Elliott's. Prof. Gray.

17. *Panicum dichotomum.*—This species is very difficult to describe on account of its chameleon-like changes at different periods of its growth, and in different soils and exposures. In the fall it looks like an entirely different plant from what it does in the spring; and in a shady thicket it is widely different in appearance from what it is when growing in a sterile and exposed place. Spikelets vary from a line to less than half a line in length. In some cases they are oblong-obovate. In others oblong-ovate. In all cases that we have ever met with, they are pubescent. Lower glume roundish, from one-third to one-fourth the length of the upper one. In one specimen before us it is so minute as to be recognized with difficulty under a lens; the lower one generally obovate, sometimes ovate, always strongly seven-nerved, usually purplish; sometimes the purple tinge is confined to the margins. Upper palea of the neutral flower less than half the length of the lower; the lower palea herbaceous, about as long as the upper glume, five to seven-nerved. Perfect flower ovate, shining, smooth, about as long as the lower glume. Panicle more or less exserted, from one to three inches long. Branches in whorls, the lower whorl often having from ten to fifteen, flexuous, somewhat compound. Toward autumn, on the breaking off of the primary panicle, the culm puts out a thick crop of leaves and a number of small, simple panicles, which are exserted or concealed by the thick foliage. Culms from eight to eighteen inches high, generally erect, but sometimes when growing in tufts procumbent. The sheaths covered with hairs springing from small tubercles, though we have

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occasionally met with them quite smooth. The two upper leaves longer than the panicle. Ligule of long hairs. Leaves more or less hairy. The root leaves are short and broad, often purple. Upper leaves from two to three inches long and from three-sixteenths to a quarter of an inch wide. The different forms of this plant have received various names. *P. pubescens* represents a variety with very long, shaggy hairs and larger flowers. One with still smaller spikelets is called *P. laxiflorum.* One with smooth, shiny leaves is *P. nitidum.*

18. *Panicum depauperatum.*—Spikelets obovate, rather acute when young, about one-eighth of an inch long, but variable, being sometimes only about half that length, conspicuously striate. The lower glume is broadly ovate, about one-third the length of the upper, and inserted a little below it; both glumes striate and acute. The lower palea of the neuter flower is about the length of the upper glume, the upper one very small. The perfect flower is ovate and about one-fourth shorter than the lower palea of the neutral flower. Panicle nearly simple, few flowered, contracted, on a long, slender peduncle, about two inches long and generally considerably exceeded by the leaves; the branches mostly in pairs, one of which bears a single spikelet, the other two. Culm cespitose, erect, mostly simple, hairy, about from six to fourteen inches high; sheaths rough, hairy; leaves narrowly linear and elongated, from four to six inches long and about one-eighth of an inch wide, involute in the fall, hairy underneath, pale green, fringed with a few long hairs at the base. Flowers in May and June. Found in dry, sandy soils, particularly on hill sides; quite common.

19. *Panicum verrucosum.*—Warty flowered panic grass. Spikelets oval, acute, very small, less than a line in length, dark green. Upper glume covered all over with small warts and obscurely nerved; the lower glume only about one-fourth the length of the upper one. Lower flower neutral, of only one palea which much resembles the upper glume. The perfect flower oval, smooth but not glossy. Panicle lateral and terminal, diffuse, capillary, few flowered, the branches flexuous. Culm smooth, slender, often branching from the base, decumbent, geniculate, one to two feet long. Leaves about one-fourth of an inch wide, smooth, shining. Flowers in August. Sandy swamps near the coast. This species is very easily distinguished by its verrucose glumes and its capillary loose spikelets.

20. *Panicum crus-galli.*—Barnyard grass. Spikelets two to three-sixteenths of an inch long, oval, on very short pedicels, rough hairy,

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imbricated on the branches. Glumes acute; lower glume about one fourth of the length of the upper one, hairy, with a strong central rib which sometimes projects a little beyond the apex; the upper glume herbaceous, five-nerved, sometimes awned. Lower palea of the sterile flower awned or awl pointed; the awns sometimes are over an inch in length, hyaline in the center, herbaceous near the margins, seven-nerved, with stiff appressed hairs. Upper palea oblong, rounded at the apex, hyaline, with only a central nerve. Perfect flower ovate, pointed, shining. Panicle a compound raceme, the branches alternate, having the spikelets thickly imbricated, the secondary branches short, giving the branches the appearance of being spiked. The panicle five or six inches long. Culms stout, branching from the base two to four feet high, erect or somewhat procumbent. Sheaths smooth, the lower ones loose. Ligule wanting. Leaves six to twelve inches long, half an inch wide, undulate margined, strongly nerved. Flowers from August to October. It varies very greatly, sometimes having very long awns and sometimes almost awnless. It is chiefly found in moist heavily manured soils, mostly around barnyards, along the lines of drainage. A rough sheathed variety grows near the salt water. (Fig. 223, *Panicum crus-galli;* Fig. 224, a spikelet spread out, showing the unequal glumes, the sterile flower with its awn and the pointed perfect flower; Fig. 225, the glumes by themselves; Fig. 226, the sterile flower; Fig. 227, the perfect flower; Fig. 228, the ovarium, pistils and stamens.) The figures are taken from Dr. Parnell's work, and probably give the English form of the grass accurately; but in this country, the spiked branches are much longer in proportion to their breadth than they are here represented. The oval white mark at the base of the leaves is not intended to represent a ligule, but simply a white mark at the base which turns orange at maturity.

60. SETARIA.—Bristly foxtail grass. Name from the Latin *seta*, a bristle. Spikelets altogether as in *Panicum* proper, and awnless, but with the short peduncles produced beyond them into solitary or clustered bristles resembling awns (not forming a real involucre). Inflorescence a dense spiked panicle, or apparently a cylindrical spike. Annuals, in cultivated grounds with linear lanceolate or flat leaves; properly to be regarded as a sub-genus of *Panicum*.

1. *Setaria verticillata.* — Spikelets compressed, almost sessile, crowded, clustered, furnished at the base with stout bristles in pairs, which are strongly toothed, the teeth pointing downward. Glumes unequal; the lower one about one-third of the length of the upper,

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broad at the base, pointed on the apex; upper glume oblong ovate, five-ribbed. The lowermost floret sterile, consisting of one palea, which very much resembles the upper glume. The upper floret fertile; the lower broader, but not longer than the upper, three-ribbed; the surface curiously dotted with longitudinal lines; the inner palea folded and also minutely dotted. Spike cylindrical, three to four inches long, somewhat interrupted, pale green; the branches on which the clusters are situated are very short; the rachis rough. Culms one to two feet long, erect, generally branched below, bearing four or five leaves. Sheaths smooth; the upper sheath longer than its leaf. Leaves flat, rough, especially on the margins. Ligule short, fringed with hairs. Anthers dark purple, seeds hard and polished. Flowers in July and August. Found in gardens and near dwellings, though it sometimes escapes into the fields, where it is a nuisance. The spikes when thrown against woollen cloth, will adhere to it, and it is well known to most playful boys from this circumstance, as they love to pelt passengers with them. Fig. 229, *Setaria verticillata;* Fig. 230, rachis with the spikelet removed, leaving the rough bristles, natural size; Fig. 231, glumes; Fig. 232, lowermost floret, single palea; Fig. 233, upper floret; Fig. 234, spikelet, showing the two bristles with reflexed teeth; Fig. 235, ligule of upper sheath, natural size, all others magnified.

2. *Setaria glauca.*—Foxtail. Bottle grass. Spikelets about one-sixteenth of an inch long, surrounded by an involucre of from six to twelve bristles about one-half an inch long, barbed upward. Lower glume about one-fourth the length of the upper one, pointed, three-nerved. Upper glume five-nerved, oblong-ovate, acutish. Lower palea of staminate flower about equal to the upper glume, five-nerved. Upper palea about as long as the lower, but more linear and pointed. Perfect flower transversely wrinkled: culm two to four feet high, with four or five leaves. Sheaths smooth. Ligule short, bearded. Leaves about one-fourth of an inch wide, four to six inches long, hairy at the base, rough on the margins. Spike two to three inches long, cylindrical, dense, growing tawny when old. Flowers in July and August. A pest in cornfields, especially at the west, where we have seen the cornfield covered with it as if it had been an old sod. We formerly supposed that it was utterly worthless, as we never knew it to be eaten by any animal, either green or dried, but we have since been informed by Dr. Warder, that he had such a luxuriant growth of it in one of his cornfields that he mowed it and made it into hay. To his great surprise, he found that in the winter season

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his cattle eat it voraciously; they would leave blue grass and timothy at any time to eat it. This is a good illustration of our ignorance of the circumstances that influence the growth of grass. We never saw it eaten by cattle in the stubble fields in a single instance, and yet there were certain special conditions in Dr. Warder's field which made it palatable to them; when we are able to ascertain what those conditions were, we shall have made great progress in grass cultivation. We once delivered an address, years ago, on the grasses, and in the course of it expressed our opinion very decidedly on the worthlessness of the tawny bottle grass. When we had finished, an old farmer came to us, and told us we were mistaken about the matter. He said: "Them seeds is master things for young turkeys, there's nothing in the world like 'em." We have since verified the old man's statement, and are well satisfied that there is no food upon which turkeys thrive better. All kinds of poultry thrive on the seeds, but none of them seem to do as well as turkeys. Dr. Darlington also confirms the statement. Fig. 235*a*, a magnified spikelet of *S. glauca;* Fig. 235*b*, the spikelet displayed.

3. *Setaria viridis.*—Green foxtail. Bottle grass. The chief difference between this and the preceding species is, that the lower glume is rather shorter; it does not become tawny with age but remains green; the perfect flower is wrinkled lengthwise, and dotted, instead of being wrinkled transversely as in *S. glauca.* There is, however, a very faint transverse marking in *S. viridis.* The Woburn experiments give the produce of the grass when the seeds are ripe, and growing in a rich siliceous soil incumbent on clay, at 5,445 pounds to the acre, which lost 3,267 pounds in drying, and gave 127 pounds of nutritive extract. It flowers in July and August, and in fact, continues to flower until frost. Mr. Sinclair says, that its seeds form the favorite food of birds. Fig. 235*c*, *Setaria viridis;* Fig. 235*d*, rachis with spikelets removed, leaving the rough bristles the natural size; Fig. 235*e*, spikelets enlarged, showing the long bristles with erect teeth; Fig. 235*f*, glumes; Fig. 235*g*, lowermost floret of one palea; Fig. 235*h*, upper floret of two paleæ; Fig. 235*i*, ovary, pistils and stamens; Fig. 235*k*, ligule of upper sheath.

4. *Setaria Italica.*—Spikelets one-sixteenth of an inch long, on pedicels as short or shorter than the spikelets, yellowish green or purplish; lower glume about one-third the length of the upper one, pointed, three-nerved; upper glume oval, seven-nerved, about equal to the neutral palea, surrounded by a cluster of toothed bristles two or three in number, varying in length from one to three-fourths of

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an inch; neutral palea much like the upper glume; perfect flower not smooth nor glossy, obscurely five-nerved; spike eight to twelve inches long, interrupted at the base, compound, drooping; culms two to four feet long; leaves from six to eighteen inches long, serrated on the margins, broad, flat; sheaths pubescent on the margins; ligule consisting of a beard. The Hungarian grass, cultivated extensively at the west and to some extent at the east, is a variety of this species. It is an annual plant and on good soil it affords a very great yield of hay. In Missouri it is very extensively cultivated, and the most of the hay used at the cattle yards connected with the railroads is made from it. It does not succeed well on heavy, moist soils, but it requires a dry, light or medium soil for its best production. It has a remarkable power of resisting drought, and when its growth is retarded by long-continued dry weather, it starts into luxuriant growth with the first rain-fall. It may be sown broadcast, but it is better to sow it in drills.

61. Cenchrus.—Hedge hog or Bur grass. Spikelets as in *Panicum*, awnless, but inclosed one to five together in a globular and bristly, or spiny involucre, which becomes coriaceous, and forms a deciduous hard and rigid bur; the involucres sessile in a terminal spike; styles united below.

1. *Cenchrus tribuloides.*—Spikelets inclosed in a horny involucre, which is thickly clothed with hairs and studded with barbed retrorse spinous processes, inclosing two or three spikelets, the involucres usually split on one or both sides; the glumes ovate lanceolate, five-nerved; sterile flower mostly staminate; perfect flower cartilaginous; raceme terminal, with from eight to twelve alternate heads or clusters; culm erect or procumbent, geniculate, branching at the base, smooth; sheaths smooth; ligule bearded; leaves flat, slightly scabrous on the margin, about one-fourth of an inch wide and from three to eight inches long; rachis angular, flexuose. Flowers in August. Very common in sandy soils about the coast, in the vicinity of the great lakes and the Hudson river. It is a great pest around dwellings on account of its thorny burs which are armed with sharp teeth, which makes it difficult to withdraw from the clothes, or the wool of sheep. Utterly worthless as food for cattle, it should be carefully extirpated as soon as it makes its appearance on a farm. Fig. 235*l*, involucre of *Cenchrus tribuloides* in flower enlarged; Fig. 235*m*, longitudinal section of same; Fig. 235*n*, a spikelet displayed.

62. Tripsacum.—Gama grass. Sesame grass. Spikelets monœcious, in jointed spikes, which are staminate above and fertile below.

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Staminate spikelets two, sessile at each triangular joint of the narrow rachis, forming a one-sided and two-ranked spike longer than the joints, both alike, two-flowered; glumes coriaceous, the lower one (outer) nerved, the inner one boat-shaped; paleæ very thin and membranaceous, awnless; anthers (turning orange or reddish brown) opening by two pores at the apex; pistillate spikelets single and deeply imbedded in each oblong joint of the cartilaginous thickened rachis, occupying a boat-shaped recess, which is closed by the polished and cartilaginous ovate outer glume; the inner glume much thinner, pointed, two-flowered; the lower flower neutral; the paleæ very thin and scarious, crowded together, pointless; styles united; stigmas very long (purple), hispid; grain ovoid, free; culms stout and tall, solid, from very thick creeping root stocks; leaves broad and flat; spikes axillary and terminal, separating spontaneously into joints at maturity.

1. *Tripsacum dactyloides.*—Spikes from four to eight inches long, generally two or three together, but sometimes solitary, the upper half staminate, the lower pistillate; when solitary, the pistillate portion is terete; when in pairs, semi-terete as if split down; when ternate the spikes are somewhat triquetrous. Culm three to six feet high, solid with pith. Leaves resembling those of Indian corn, roughish on the upper surface, serrulate on the margins. Sheaths smooth. Ligule short and hairy. Seeds ovoid, smooth. Flowers in July. Found in moist soils from Connecticut to Pennsylvania near the coast, thence west to Illinois, and southward. This is one of the largest of our grasses and is only exceeded by *Phragmites communis* and *Zizania aquatica.* It is not very common on the Atlantic slope, but much more abundant on the Mississippi valley. Cattle will eat it when young, but it hardens when old and then it makes very poor fodder; it will only be tolerated when nothing better can be had. Fig. 235*o*, a piece of the spike of *T. dactyloides* natural size; Fig. 235*p*, a longitudinal section of one of the pistillate spikelets; Fig. 235*q*, a pistillate spikelet with the parts displayed; Fig. 235*r*, a staminate spikelet (two-flowered) with its parts displayed.

63. ERIANTHUS.—Woolly beard grass. Name from the Greek *erion*, wool, and *anthus*, flower. Spikelets spiked in pairs upon each joint of the slender rachis; one of them sessile, the other pediceled; otherwise both alike, with the lower flower neutral, of one membranaceous palea; the upper perfect, of two hyaline paleæ, which are thinner and shorter than the nearly equal membranaceous glumes, the lower awned from the tip. Stamens one to three. Grain free. Tall and

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stout, reed like grasses, with the spikes crowded in a panicle, and clothed with long silky hairs, especially in a tuft around the base of each spikelet.

1. *Erianthus alopecuroides.*—Culm four to six feet high, woolly-bearded at the joints; panicle contracted; the silky hairs longer than the spikelets, shorter than the straight awn, or at length contorted. Stamens two. Annual. Flowers in September and October. Wet pine barrens, New Jersey, Illinois, and southward, rare. Prof. Gray Fig. 235*s*, part of the hairy inflorescence with two spikelets of *E. alopecuroides*, enlarged. Fig. 235*t*, one of the spikelets displayed.

2. *Erianthus brevibarbis.*—Culm two to five feet high, somewhat bearded at the upper joints; panicle rather open, silky hairs shorter than the spikelets. Annual. Low grounds, Virginia and southward. Prof. Gray.

64. ANDROPOGON.—Beard grass. Spikelets in pairs upon each joint of the slender rachis, spiked or racemed; one of them pedicelled and sterile, often a mere vestige; the other sessile, with the lower flower neutral and of a single palea; the upper perfect and fertile, of two thin and hyaline paleæ shorter than the herbaceous or chartaceous glumes, the lower awned from the tip. Stamens one to three. Grain free. Coarse and mostly rigid perennial grasses with lateral or terminal spikes, commonly clustered or digitate, the rachis hairy or plumose-bearded, and often sterile or staminate flowers also.

1. *Andropogon furcatus.*—Spikelets about half an inch long, including the pair, the lower flower five-sixteenths of an inch, the upper about one-fourth of an inch, the pedicel of the sterile flower one-fourth of an inch long, purplish. Glumes of the sessile flower furnished with a tuft of white hairs at the base, equal, acuminate; inner glume purplish, hairy on the upper part, especially on the keel, three-nerved; the outer yellowish, hairy on the margins, with marginal nerves. The awn of the neutral flower one-half of an inch long, bent and somewhat channeled. The glumes of the upper or pediceled flower purplish, hairy; the hyaline paleæ acuminate and purplish, inclosing three stamens. Spikes digitate, usually three or five on the terminal ones, but fewer on the lateral, two to three inches long. Culms three to four feet high, simple or branching. Sheaths smooth. Leaves flat, rough on the margins. Ligule long, acute, lacerate. Seed oblong, brown. Flowers in September. Common on rocky banks and sterile soils. Fig. 235*u*, small portion of the spike of *A. furcatus* enlarged with one fertile and awned spikelet, and one stami-

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nate and awnless spikelet; Fig. 235*v*, the fertile spikelet; Fig. 235*w*, the staminate spikelet displayed.

2. *Andropogon scoparius.*—Spikelets in pairs alternate and distichous, somewhat distant. Glumes of the lower or neuter flower situated on the summit of a very hairy pedicel, very unequal, lower glume awned, the upper one often wanting. Glumes of the perfect flower smooth, lanceolate; the fertile flower with a delicate and generally twisted awn. Spikes generally single, two or three inches long on the short branches of the culm, and from three to five inches long on its summit, the lateral ones sometimes in pairs, loose and slender, peduncled, covered with white silky hairs. Rachis flexuous and hairy on the edges. Culms three to four feet high, generally branching. Sheaths smooth above, hairy below. Leaves narrow and hairy, sometimes glaucous. Flowers in August. Dry, barren soils. Often called broom grass by farmers.

3. *Andropogon argenteus.*—Culms rather slender, about three feet high. Spikes in pairs, on a peduncle exceeding the sheaths, dense, very silky, with long, white hairs one and a half to two inches long; rudimentary flower much shorter than the hairs of its pedicel. Spikes much denser, and the flowers large and more silky than the next, which it considerably resembles. Flowers in September and October. Sterile soil, Virginia, Illinois and southward. Prof. Gray.

4. *Andropogon Virginicus.*—The sterile spikelet abortive. There is an awn-like and plumose pedicel without glumes, longer than the perfect one. The glumes of the perfect flower lance-linear, equal. The fertile flower bears a single stamen, and is furnished with a straight, delicate awn, and is half an inch or more in length. The spikes are both lateral and terminal, clustered together in twos and threes, partly inclosed in the sheaths, distant, appressed, about one inch in length. Rachis filiform, clothed with long, silky, white hairs. Culm slender, short branched above, compressed below, about three feet high. Sheaths smooth. Leaves twelve to fifteen inches long, the lowest ones hairy on the margins and upper surface. Flowers in September. Sandy soil. New York to Illinois and southward.

5. *Andropogon macrourus.*—Cluster-flowered beard grass. Flowers similar to the preceding species. Spikes lateral and terminal, in pairs, about one inch long, the peduncles in dense fastigiate, that is, parallel and upright, panicles. Culm two to three feet high, very greatly branched at the top, giving it a bushy appearance. Sheaths rough, the upper hairy. Leaves long below, short and lanceolate above, and generally hairy. This grass is easily distinguished from

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the preceding by its clustered spikes and by the roughness of its lower sheaths. Flowers in September and October. Low grounds and swamps, especially near salt water.

65. Sorghum.—Spikelets, two to three together on the ramifications of an open panicle, the lateral ones sterile, or often reduced merely to their pedicels; only the main or terminal ones fertile; its glumes coriaceous or indurated, sometimes awnless; otherwise nearly as in *Andropogon*. Stamens three.

1. *Sorghum nutans*.—Perfect spikelet sessile, the one or two lateral ones on hairy pedicels about one-eighth of an inch long; glumes of the fertile and sterile flowers linear, about one-fourth of an inch long, light brown, sparsely clothed with long white hairs, five-nerved, about equal, a tuft of white hairs at the base; palese lance-linear, chartaceous, the lower bearing on its apex a twisted and bent awn, the upper awl pointed, ciliate on the margin; anthers orange colored; panicle terminal, narrowly oblong, six to twelve inches long; erect at first, but nodding when mature, composed of five or six primary capillary branches in a whorl, smooth; the shorter ones clothed with spikelets nearly to the base, the longer ones an inch or more long before the subordinate branches appear; culm simple, three to five feet high; sheaths smooth; leaves glaucous, from twelve to eighteen inches long, from one-fourth to one-half an inch wide; ligule elongated. Flowers in August and September. Dry sandy soil. Of no known agricultural use. Fig. 235*x*, a fertile spikelet of *S. nutans*, enlarged, with a sterile pedicel on each side; Fig. 235*y*, the spikelet displayed.

66. Bucheoe.—Nov. Gen. Buffalo grass. Every reader of the newspapers and of the works of trans-continental travellers, is familiar with the trivial name of this grass; it is the chief support of the immense herds of buffalos that roam over our western plains, and of the oxen driven by overland emigrants. Until recently it has been very difficult to obtain any reliable botanical account of it, as it is dicœcious (*i. e.*, having stamens and pistils on separate flowers which are on different plants), and the different plants having little resemblance to each other, they were placed in different genera. The female plant being called by Steudel, *Antephora axilliflora*, and the male plant by Nuttall, *Sesleria dactyloides*. Dr. Engelmann, of St. Louis, while examining some specimens found by Mr. A. Fendler near Fort Kearney, on the Platte river, was fortunate enough to find a specimen in which the grass assumed a monœcius form (*i. e.*, the stamens and pistils in different flowers growing on the same plant.

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Fig. 236). This accidental discovery settled the question that both grasses were one and the same; and Dr. Engelman therefore put it in a separate genus, which he named *Buchloe*, which he thus defines:

Flowers dicœcious, heteromorphous (*i. e.*, of two or more shapes). Staminate plant; spikelets two to three-flowered, which are upon two rows on a one-sided spike; glumes two-valved, one-nerved, the lower much smaller than the upper; paleæ two, of equal length and exceeding the glumes; the lower palea three-nerved and tipped with a minute bristle; the upper palea two-nerved and truncated; the little scales double, truncate and emarginate. Stamens three; anthers linear, no rudiment of an ovary. Pistillate plant: Spikelets single flowered, collected upon one to three short head-shaped oblique spikes, involucred with the sheaths of the upper leaves; the uppermost florets withering, resembling three-cleft involucral scales; glumes two, the lower glume of the lowest spikelet with one to three nerves; the apex herbaceous, lanceolate, awl-shaped, or two to three-cleft, adhering by the lower side to the back of the upper glume; the lower glume of the other spikelets (internal with respect to the head) free, much smaller, membranaceous, ovate-lanceolate, acute, one-nerved; the upper glumes (external) joined at the base to the thickened rachis, resembling greatly the ligneous bony involucre, ovate, nerveless, pale, three-cleft, with an herbaceous head full of nerves; the lower palea (internal with respect to the head) shorter, three-nerved, herbaceous, three-toothed; upper palea shorter, two-nerved, scales as in the male flowers, three minute rudiments of stamens; the ovary bean-shaped, very short stalk to the pistil, smooth; stigmas much elongated, with two erect terminal styles, feathery, with simple hairs protruding from the apex of the flower; caryopsis free, included in a bony head, which is finally wholly deciduous, sublenticulate on the outside (toward the lower palea) where the embryo is, flat, on the inside convex. Perennial, stoloniferous, low, sparsely hairy or somewhat glabrous, with bearded ligulæ. The name is abbreviated from *bubalochloë*, which is the vernacular name turned into Greek.

Buchloë dactyloides.—This species is described by Dr. Engelmann, in the Transactions of the Academy of Science of St. Louis, volume one, number three, as follows: It is found in our western prairies from the British possessions throughout the Missouri Territory, Nebraska, Kansas, and New Mexico, down to Texas and northern Mexico, and is, under the name of "Buffalo grass," well known to hunters and trappers, as one of the most nutricious grasses, on which,

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for a part of the year, subsist and fatten the immense herds of buffalo, and the cattle of the hunter and emigrant. The buffalo grass grows in immense tufts, sending out stolons. These, in most herbarium specimens, are only a few inches long, with internodes of one-half to two inches in length; Lindheimer, however, sends specimens from New Braunfels, Texas, with stolons one to two feet long, the internodes often measuring over three, and even as much as five inches. The male plant seems to throw out more numerous runners than the female, and may often overspread, and kill it out, which would account for the much greater scarcity of the latter. Leaves two to four inches long, one-half to one and a half lines wide, sparsely hairy, or ciliate, or glabrous; sheaths striate, glabrous, strongly bearded at the throat.

The flowering stems of the male plant are four to six, or rarely eight inches high, mostly glabrous or very sparsely hairy, generally longer than the leaves, and bear two or three alternate oblique one-sided spikes. These spikes are three to six lines long, and bear on the lower, outer side of the flattened, dentate, pubescent rachis six to fifteen minutely pulverulent spikelets, alternate in two rows; the uppermost spikelet is usually abortive, and is represented by a bristle. The spikelets are two or rarely three lines long, with two, or sometimes three sub-terete flowers; they are, as usual, among chlorideous grasses, somewhat obliquely distorted; the glumes are broader on their lower side, but turning upward, toward the upper end of the spike, they cover the upper edge of the flowers, leaving the lower edge free. The smaller lower glume is, as in this whole tribe of grasses, inside of the spike, and the larger upper one outside, and much more conspicuous.

Lower glume ovate-lanceolate, with a scarious margin, convex, scarcely carinate, one-nerved, obtuse or acutish, or mucronate, one-fourth the length of the flower; on the uppermost spikelet of each spike, it is much larger, and almost equal to the upper glume.

Upper glume twice as long as the lower one, much wider, ovate, obtuseish, with a strong middle nerve, which sometimes runs out into a point or a short awn between two membranaceous teeth; in a specimen from Fort Kearney, I find on the lower side, a second nerve running out into a lateral tooth; a third nerve on the upper side is very indistinct; other spikelets of the same specimen show the ordinary structure.

Lower palea convex, obtuseish, three-nerved, middle nerve in the lower flower running out into a mucro; in the upper one mostly even with the membranaceous margin.

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Upper palea as long as, or a little exceeding the lower one, which partly envelops it, two-nerved, two carinate, obtuse and scarious at tip.

Scales, *lodiculæ*, two at the margin and inside of the lower palea minute, triangular-truncate, undulate or emarginate.

Stamens three, scarcely exceeding the paleæ; anthers linear, bifid at both ends, one line long; filaments much shorter. Pollen grains of the dry anther, immersed in water, globular, smoothish, .017 line in diameter.

The stalk of the *female* plant is much shorter than the leaves, usually one and a half to two and very rarely three to four inches high; it is leafy to the top, the broad ventricose, many-nerved sheaths of the two to three uppermost leaves serving as involucres for the flower heads. These heads, three to three and a half lines long, are usually two in number, one almost sessile between both top leaves and on the side of the lower ones, the other on a flattened pedicel on the side of the upper leaf, sometimes a third head is noticed still higher, and on the side of the lowest one. The pedicels of these heads are nothing but the common peduncle or rachis terminating the stem, and the heads themselves correspond to as many lateral spikes of the male plant, in position as well as in structure; they are only more contracted, consist of fewer one flowered spikelets and turn obliquely upward, while the male spikes turn obliquely downward; where the number of spikelets does not exceed three, the head is ventricose-cylindric, or in fruit, subglobose; but when the number is larger, it is compressed and laterally elongated, showing distinctly enough the bi-serial arrangement. The pistillate spikelets are like the staminate ones, arranged so that the lower glume is inside and the upper one outside in the head.

The thick rachis of these heads is firmly united with the upper glumes, which in fruit become ligneous; they have a pale whitish or straw color, and smooth and shining surface, with a few scattered hairs; at maturity they separate entire from the common peduncles, at the insertion of which a tuft of short hairs is noticed.

The lower glume is a small triangular or ovate obtuse, acute or acuminate, one-nerved, carinate scale completely hidden in the interior of the head. The lower glume of the lowest spikelet only is larger with two or three foliaceous points turned half outside, and with its lower edge united to the back of the corresponding upper glume.

Upper glumes much larger, the largest organ of the spikelets convex outside, concave inside, broadly ovate, narrowed at base, and separated

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there from one another by a deep and rounded sinus; terminating in three herbaceous, nerved, lanceolate-linear lobes, a larger central and two smaller lateral ones.

Lower palea, of course, opposite to the upper glume and therefore turned toward the center of the head, much smaller, also three-pointed, with two further lateral membranaceous teeth, enveloping the upper palea.

Upper palea still smaller, two-nerved, membranaceously two-pointed. Scales similar to those of the staminate flowers.

Three minute rudimentary stamens at the base of the short-stipitate compressed lenticular ovary, which at the apex bears two rather short erect styles and elongated stigmata, protruding from the apex of the flower. Hair of the stigma simple, rather short and scarcely dentate.

Mature head ventricose, thick, extremely hard, inclosing the loose grain. Grain about one line long, orbicular, ovate, flat on the outer (turned toward the lower palea and inside of the head) and convex on the inner face, two-pointed at the apex by the persistent bases of the styles. Embryo on the flat outer side of the grain and almost as long as it. Each spike or head has, with very rare exceptions, at the upper end an incomplete rudimentary spikelet, consisting of a single two to three pointed upper glume. This, with the similar looking lower glume of the lowest spikelet, seems at first glance to form an involacrum for the head; or the upper glumes together have been taken for an involucrum; the lower glumes were overlooked, and the plant placed with the panicious genus *Antephora*, Schreb, which is closely allied to *Cenchrus*. From the analysis given above, it will be seen that this view is based on a very superficial examination of our plant; and that the structure of the head is entirely analogous to that of the staminate spike of this and the spike of the chlorideous grasses in general, from which the buffalo grass can in no manner be separated.

67. Monanthochloe, Nov. Gen.—Flowers dicœcious, somewhat similar. Spikelets single terminal, sessile, three to five flowered, without glumes.

Male plant.—Lower flower neuter. Lower palea foliaceous, either standing alone or with the upper palea entire, hyaline, emarginate or bilobed. The second flower very rarely with a single palea, occasionally neuter, generally horizontal. The third and also the fourth terete, elongated and staminiferous. The last flower is also abortive and reduced to a stipe with two palea. The lower palea of the staminiferous flower, is ovate-lanceolate, convolute. obtuse with a scarious

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apex, growing upward, many (nine to eleven) indistinct nerves, pale beneath, coriaceous and nerveless.

The upper palea a little exceeding the inferior, convolute, obtuse with a scarious apex, two-keeled on the back, without scales. Stamens three. Anthers linear and each one deeply two-lobed, longer than the filaments, scarcely exserted. No rudiment of an ovary.

Female plant.—The spikelets similar to those of the male. Flowers generally two, more rarely one or three, fertile. The lower palea inwrapping the upper flowers of the base. Upper palea two-winged-keeled, with wings convolute around the upper flowers, without scales, three minute rudimentary stamens. Ovary linear-lanceolate, triangular, on a narrow stem at the base, smooth, bifid, with an acute apex. Styles terminal, erect, equaling the ovarium. Stigmas as long again as the styles, exserted from the apex of the flower, plumose with simple hairs. Caryopsis free, triangular.

The grass inhabits the shores of the Gulf of Mexico, Texas and Florida. It is branching, stoloniferous and shrubby. The very short leaves are rigid and scurfy, with scarcely visible flowers.

Monanthochloë litoralis.—Perennial, shrubby, branching, stoloniferous, with smooth leaves, fasciculated, linear, sickle-shaped, short, rigid and many nerved, cartilaginous, with a somewhat obtuse apex, hairy upward to the nerves, with a rough, ciliated margin. Ligule short, truncated, with short hairs. Spikelets solitary on the top of the stem and branches, sessile within the upper leaves.

Englemann writes as follows: This peculiar and most interesting grass has been sent by Drummond from Texas, by Berlandier, from the region of Matamoras (north of the Rio Grande?), by Blodgett, from Key West, Florida; and Lindheimer found it in flower in May, on the island of Galveston, Texas, 'covering large tracts of moist, sandy, saline soil.' I have been able to examine Berlandier's specimens, female plants in flower, and those of Lindheimer, who collected both sexes, the females more abundantly than the males. The ripe fruit is unknown to me.

Stems five to eight inches high, much branched, erect, or often at last decumbent and rooting. Upper branches mostly short, four to six lines long.

Leaves short, rarely more than three lines long, very rigid, strongly nerved, apparently permanent in winter, mostly crowded at the ends of the stems and branches. The upper leaves all bear axillary buds more or less developed. Spikelets between three and four lines long, solitary, terminal, inclosed by the uppermost leaves, which form a

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complete and uninterrupted transition to the floral envelopes, the uppermost leaf, without the intercession of glumes, representing the lowest palea of the spikelet. This uppermost leaf or lowest palea has a doubtful and intermediate character, and might be taken for one or the other, or for a glume whenever it is empty; but often it includes an hyaline scale, which cannot be anything else but an upper palea, and therefore characterizes this lowest organ of the spikelet as the lower palea of the lowest always incomplete and neutral flower. It cannot be supposed that a glume is missing or abortive, as we can follow the regular succession of bud bearing leaves to this lowest floral leaf or palea. The upper palea of this lowest flower, when present, is usually extremely thin and transparent. It is small or large, flat or reflexed, nerveless or (very rarely like the other upper paleæ) bicarinate. It is entire, lanceolate or ovate, or emarginate, or bilobed, or sometimes divided into two unequal lanceolate parts, placed side by side, and in some flowers laterally protruding from the base of the lower palea, and rather oddly placed on both sides of the spikelet.

The second flower is like all the others, pediceled, and is mostly perfect; that is, staminate or pistillate. In a very few instances (see Fig. 271) it was found neutral, and either with a somewhat foliaceous lower palea or with both paleæ smaller than in the other flowers. Rarely it is reduced to a single palea, which is herbaceous or membranaceous. In a single instance it was almost entirely suppressed, and the third flower, above and on the same side as the lowest one, appeared to be the second. The rare case where two single empty paleæ alone are left of the two lowest flowers approaches nearest to the regular structure of the grass flowers. Those paleæ then assume the place and apparent function of glumes, and the spikelet then resembles that of *Koeleria*, for example, in the arrangement of its parts. The normal variability in the formation of the floral envelopes of this grass thus furnishes an interesting clue to the morphology of these organs.

The third flower, usually well developed, is sometimes (oftener in the female than in the male plant) reduced to a mere rudiment.

In female plants, I have never seen more than two pistillate flowers, and very rarely a rudimentary fourth flower; male plants show often three staminiferous flowers, usually with an upper abortive one.

The spikelet, therefore, is destitute of glumes, and consists of three to five flowers, of which always the lowest, sometimes the second,

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and usually the uppermost one, are neutral or rudimentary, and of which one to three of the middle ones bear stamens or pistils.

The lower palea of the fully developed flowers is ovate-lanceolate, obtuse at the scarious point, and envelopes not only the upper palea, but also the base of the upper flowers; it is faintly nine to eleven-nerved in the upper, and indistinctly three-nerved in the lower half, thus representing, as it would seem, both parts of the leaf, the sheath and the blade; nothing like a ligule however, can be found.

The upper palea is narrower, and a little longer than the lower one, especially in the male flowers, obtuse and scarious at tip, and, in the female, closely envelopes the pistils. In the staminate flower it is bicarinate on the back; in the pistillate flower these keels are developed into wings, which are rolled around the upper flowers as is indicated in the diagrams.

No scales (*lodiculæ*) were seen in either flowers. Stamens scarcely longer than the paleæ; anthers linear, deeply bilobed at both ends, longer than the filaments. In the pistillate flower, three minute triangular bodies seem to represent the stamens.

The stipitate ovary is elongated, triangular, with one angle toward the lower, and two toward the keels of the upper palea; it is deeply bifid; the lobes terminating into straight, erect styles. Simple hairs of the feathery stigma scarcely dentate.

I have now given a very full description of all the grasses which the farmers of the northern States will be likely to be much interested in, and have told all that I know about their composition, their properties, their nutritive qualities, and their habits of growth.

It must be confessed, with shame and confusion of face, that all the observation and experience of farmers for so many centuries is very trivial and unimportant. I have shown in the preceding pages the supreme importance of the gramineæ, the high place that they occupy in the vegetable kingdom; whether we consider the relative number of the species, their relations to animal life, to commerce and to the pecuniary success of individuals; and, in view of this, it is indeed strange that so little reliable information should have been collected respecting them. Many reasons might be assigned for this ignorance and indifference; but we are satisfied that the chief cause is the inability of farmers to identify the various species. There is such a general similarity in the appearance of different grasses that they do not take the pains to distinguish them, although they vary so very much in their value and their habits of growth; hence we believe that farmers

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must be habituated to a prompt and ready detection of the different species before we can expect any improvement in our practical knowledge of grasses.

It is with the hope of promoting this object that we have prepared the foregoing descriptions of those which, in the present state of our knowledge, are deemed of the most importance. We think that we cannot be mistaken in supposing that any farmer whatever, by the aid of these descriptions and illustrations, will be enabled easily and promptly to identify any grass which may grow upon his farm. Farmers are unfortunately disposed to be frightened at what they call hard words; hence when they meet with a book, or an article in a newspaper, which contains them, they drop it as they would the small-pox or any other plague; but they should remember that it is impossible to speak precisely without the use of technical terms; they use them themselves every day and cannot get along without them. The words *snath*, *neb*, *clevis*, are as unintelligible to a merchant as *stamen*, *distichous* and *ligule* are to them, yet these words are as essential to the proper description of the plants they cultivate as the former class of words is to describe the parts of a scythe and a plough. We have used no technical words, in the descriptions that we have given, without fully defining so that all can understand them. On looking over the words which have been defined, we find that there are just eighty-seven of them. The labor of mastering these words is but a small price to pay for the advantages which will result from a perfect understanding of all the parts of a grass, and the ability to describe those parts without any possibility of ambiguity in the description.

Let the student observe whether the grass that he wishes to identify has one, or two, or three, or more flowers in the spikelet; if he finds that it has two, the range of his examinations will be greatly limited; he will not be obliged to look among the grasses that have a single flower or among those that have *more* than two flowers. Then let him observe whether the flower in his hand is awned or without awns. If it has an awn, his range of search is still farther reduced; he will not pay any attention to the unawned species, but confine himself wholly to those which have awns. The next point to observe is the *insertion* of the awn. If he finds that the awn is inserted at the *base* of the flower, his range of examination is still farther reduced; he will not attend to any species where the awn is inserted on the middle of the flower, or at its apex. The next step is to observe the shape of the awn, whether it is straight or curved or twisted; if he

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finds that it is straight, this, of course, excludes all those with curved or twisted awns. This process will bring him down to so narrow a range of search that he will find no difficulty in identifying his grass by the description of the other parts. We think any young energetic farmer who sets himself resolutely to the task, will easily succeed in identifying any grass the first time that he tries to do so, and, of course, every successive trial will be more easy than the preceding, and will be accomplished with greater facility.

The young farmer should keep a blank book in some convenient place in which he will record all the observations on the grasses which he makes during the year. He should observe which is the first grass on the farm to start in the spring; which the cattle seem fondest of at different seasons of the year; which they thrive best on; which gives the most butter; which the most cheese; which exhausts the land most; which grows best on wet land, and which on dry; the different aspects presented by the same grass when growing on sandy or clayey soils; indeed all the modifications produced by different soils on the same species. What kind of manures are best adapted to each soil; which loses most weight in drying; the effect of early and late cutting on the succeeding crop; the insect enemies to which each kind is most liable; which matures its seeds best; the effect of shade and sunshine; which resists drought best; the size of the interspaces between the culms; the disposition to throw out stools from the roots. These, and many other matters which will readily suggest themselves to the observing farmer, if carefully observed and accurately recorded, will soon give us an accumulation of reliable facts in all parts of the country which will enable us to establish a perfect science of the grasses. Guided by the knowledge thus acquired, we shall learn to adapt the different grasses to the soils most favorable to their production, and to increase the crops to an extent that we now little dream of.

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TABLE I.—*Showing the soils on which the different species are found to flourish.*

SANDY AND DRY SOILS.
Cynodon dactylon.
Tricuspis sesleroides.
Vilfa aspera.
Vilfa vaginæflora.
Sporobolus juncens.
Sporobolus heterolepis.
Sporobolus cryptandrus.
Agrostis scabra.
Muhlenbergia capillaris.
Calamagrostis longifolia.
Oryzopsis Canadensis.
Stipa avenacea.
Stipa spartea.
Aristida gracilis.
Aristida stricta.
Aristida purpurascens.
Aristida oligantha.
Aristida tuberculosa.
Bouteloua curtipendula.
Bouteloua hirsuta.
Bouteloua oligostachya.
Eragrostis Purshii.
Eragrostis tenuis.
Eragrostis capillaris.
Festuca tenella.
Unicola paniculata.
Aira flexuosa.
Avena præcox.
Paspalum setaceum.
Panicum filiforme.
Panicum capillare.
Panicum autumnale.
Panicum amarum.
Panicum xanthophysum
Cenchrus tribuloides.
Andropogon Virginicus.

SANDY WET SOILS.
Sporobolus serotinus.
Calamagrostis brevipilis.
Ctenium Americanum.
Triticum dasystachyum.
Amphicarpum Purshii.
Panicum anceps.
Panicum virgatum.
Panicum verrucosum.
Erianthus alopecuroides.
Erianthus brevibarbis.
Andropogon macrourus.

SANDY SOIL ON THE SEA SHORE.
Vilfa Virginica.
Glyceria obtusa.
Glyceria maritima.
Eragrostis pectinacea.
Calamagrostis arenaria.
Tricuspis purpurea.
Uniola gracilis.
Lepturus paniculatus.
Hordeum pusillum.
Panicum filiforme.
Panicum proliferum.
Panicum amarum.
Panicum verrucosum.
Tripsacum dactyloides.

MOIST, RICH MEADOWS AND PASTURES.
Alopecurus pratensis.
Alopecurus geniculatus
Phleum pratense.
Agrostis canina.
Agrostis vulgaris.
Agrostis alba.
Muhlenbergia Mexicana.
Calamagrostis Canadensis.
Poa annua.
Poa serotina.
Poa pratensis.
Poa compressa.
Briza media.
Festuca elatior.
Lolium perenne.
Lolium Italicum.
Triticum repens.
Triticum caninum.
Trisetum palustre
Arrhenatherum avenaceum.
Holcus lanatus.
Hierochloa borealis.
Phalaris Canariensis.
Milium effusum.
Panicum glabrum.
Panicum viscidum.
Panicum pauciflorum.
Panicum dichotomum.
Anthoxanthum odoratum.

MARSHES AND WET MUD.
Leersia oryzoides.
Leersia Virginica.
Leersia lenticularis.
Alopecurus aristulatus.
Agrostis elata.
Calamagrostis confinis.
Calamagrostis coarctata.
Spartina cynosuroides.
Dupontia Cooleyi.
Glyceria Canadensis.
Glyceria nervata.
Glyceria acutiflora.
Phragmites communis
Hordeum jubatum.
Aira cæspitosa.
Paspalum fluitans.
Paspalum distichum.
Erianthus brevibarbis.
Trisetum palustre.

SHALLOW WATERS (FRESH).
Zizania aquatica.
Zizania miliacea.
Glyceria aquatica.
Glyceria fluitans.
Phalaris arundinacea.

BOGS.
Sporobolus compressus.
Muhlenbergia glomerata.

SALT MARSH.
Spartina cynosuroides.
Spartina juncea.
Spartina stricta.
Leptochloa fascicularis.
Glyceria distans.
Bryzopyrum spicatum.
Panicum proliferum.

MOIST, SHADY PLACES.
Diarrhena Americana.
Dactylis glomerata.
Eatonia Pennsylvanica.
Glyceria elongata.
Poa trivialis.
Eragrostis Frankii.
Bromus ciliatus.
Gymnastichum hystrix.
Avena striata.
Milium effusum.
Panicum anceps.
Panicum latifolium.
Panicum clandestinum.
Panicum microcarpon.
Erianthus alopecuroides.

DRY, SHADY PLACES.
Muhlenbergia diffusa.
Gymnopogon racemosus.
Gymnopogon brevifolius.
Poa brevifolia.
Poa flexuosa.
Poa alsodes.
Poa debilis.
Poa sylvestris.
Poa nemoralis.
Eragrostis poæoides.
Eragrostis pilosa.
Festuca nutans.
Elymus striatus.
Elymus Virginicus.
Elymus Canadensis.
Panicum depauperatum.

DRY, OPEN PLACES.
Koeleria cristata.
Eatonia obtusata.
Bromus secalinus.
Bromus racemosus.
Bromus mollis.
Bromus Kalmii.
Arrhenatherum avenaceum.
Sorghum nutans.

GRAVELLY RIVER BORDERS.
Eragrostis reptans.
Elymus Virginicus.
Elymus Canadensis.
Poa serotina.

MOUNTAIN TOPS AND SIDES.
Phleum alpinum.
Calamagrostis Pickeringii.
Stipa Richardsonii,
Poa laxa.
Festuca ovina.
Hierochloa alpina.
Trisetum subspicatum.
Aira atropurpurea.

CLAYEY AND STERILE SOILS.
Danthonia spicata.
Andropogon furcatus.
Andropogon scoparius.
Andropogon argenteus.

CULTIVATED SOILS, BARNYARDS, HOUSEYARDS, &c.
Panicum glabrum.
Panicum sanguinale.
Panicum dichotomum.
Panicum capillare.
Panicum crus-galli.
Setaria verticillata.
Setaria glauca.
Setaria viridis.

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GLOSSARY OF TERMS

USED IN DESCRIBING GRASSES, THEIR ORGANS AND ARRANGEMENTS.

Abnormal—Irregular; differing from the usual plan of structure.
Abortion—The non-completion of the plan, or the imperfect formation of a part.
Abrupt—Terminating suddenly.
Accessory—Something additional, supernumerary.
Accumbent—Lying against another body; generally edgewise.
Acuminate—Prolonged into a tapering point.
Acute—Sharp pointed.
Alternate—(Leaves.) Situated one above another; not opposite.
Androgynous—Having pistils and stamens in distinct and separate flowers, but on the same plant; generally on the same spike.
Androus—A suffix in words derived from the Greek, and refers to stamens, thus: di-androus, having two stamens; tri-androus, having three stamens.
Annual—Living through but one season.
Anther—The organ of the stamen which incloses the pollen; see Fig. 235*w*, *a*.
Apex—The top or outer end, opposite to the base.
Appressed—Lying close against, or pressed together.
Arcuate—Curved, like a bow when it is bent.
Articulated—Jointed, united by severable surfaces.
Ascending—Rising obliquely curved from the ground.
Assurgent—Same as ascending.
Awl-shaped—Narrow and growing narrower to a point, like a shoemaker's awl.
Awn—A bristle-like process proceeding from the glumes or paleæ of many grasses; see Figs. 171*c* and 177.
Axil—The angle between a leaf and a stem on the upper side; the ligule is in the axil of a grass; see Fig. 235*k* and Fig. 3.
Bearded—Beset with long, stiff hairs, as the spike of *A. furcatus*, in Fig. 235*u*.
Biennial—Living through two seasons.
Bifid—Two-cleft; see paleæ of *Avena striata*, Fig. 174*a*.
Bifurcate—Forked; ending in two equal branches.
Bisexual—Having the organs of both sexes, both stamens and pistils.
Boat-shaped—Concave within and convex without, generally keeled.
Bristles—Short, stiff hairs, elastic and either straight or curved.
Bud—An undeveloped stem.
Bulb—A permanent bud with fleshy scales, generally subterranean.
Bulbose—Bulb-like in shape.
Calyx—The exterior floral envelope; the glumes of grasses form the calyx.
Cæspitose—Growing in bunches or tufts.
Carinate—Keeled, having a longitudinal ridge on the under side.
Capillary—Hair-like.

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Cartilaginous—Tough, like cartilage.
Caryopsis—A grain; the seed completely fills the cell and is covered with a thin pericarp.
Cell—The cavity of an anther or ovary.
Cilia—Hairs or bristles fringing the margin of a leaf, glume or palea.
Ciliate—The margin fringed with hairs.
Chartaceous—Having a texture resembling paper.
Chaff—The dried glumes and paleæ of grasses.
Clavate—Club-shaped; narrow below and enlarged toward the summit.
Coherent—United together.
Corneous—Horny.
Contorted—Twisted.
Connate—Grown together from the first.
Coriaceous—Of a leathery consistency.
Corrugated—Wrinkled.
Cordate—Heart-shaped.
Culm—The stem of grasses.
Deciduous—Falling off at the usual time. The sterile spikelets of *Sorghum nutans*, are deciduous.
Decumbent—Leaning on the ground, but rising at the top.
Decurrent—When leaves are adherent to the stem below the point of their insertion; the two edges of the leaf thus continued downward are called wings.
Descending—Tending gradually downward.
Depauperate—Few flowered; a stunted efflorescence.
Dichotomous—Branching in twos.
Digitate—Finger-like; the spikes branching like a fan from a common center, as in *Panicum sanguinale.*
Dioecius—A uni-sexual plant; the staminate flowers growing on one plant and the pistillate flowers on another, as in *Buchloë dactyloides* (Buffalo grass).
Distichous—Leaves on opposite sides of the stem and in two rows.
Divaricate—Branches which issue from the stem at right angles.
Divergent—Spreading widely.
Dorsal—Belonging to or growing from the back.
Emarginate—Having a notch at the end.
Endosperm—The albumen surrounding the germ.
Enerved—Without nerves.
Enodal—Without a node.
Ensiform—Sword-shaped.
Entire—Without notches on the margin.
Epidermis—The outer skin of an organ.
Erianthous—Woolly; covered with wool.
Ergot—A disease of seeds caused by the attack of minute fungus or mould.
Exserted—Protruded beyond, as the stamens beyond the edges of the paleæ.
Fastigiate—Level topped; the summits of the branches reach the same height.
Fertile—Having perfect pistils, and producing fruit.
Fibrils—Delicate thread-like appendages; root hairs.
Fibrous—Composed of fibrous tissues, thread-like.
Filament—The thread-like support of the anther.
Filiform—Having the form of a thread.
Fimbriate—Finely divided, like a fringe.
Flexuous—Having a succession of short alternating curves, zig-zag.

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Floret—A little flower, usually one of a compound flower, as in the grasses; a pair of the paleæ in the genus *Poa* forms a *floret*.

Foliaceous—Resembling a leaf in form and texture.

Fusiform—Spindle-shaped, largest in the middle and tapering to each end.

Generic—Pertaining to a genus.

Geniculate—Knee-like; forming an angle at the joints.

Genus—A group of species which have a general agreement in their structure. Every species is named by the names of the genus and species conjoined.

Germ—The part of a seed or bud which grows; an embryo.

Germination—Is the process by which the albuminous and carbonaceous portions of the seed are conveyed to the germ, causing it to grow.

Glaucous—Silvery; covered with a greenish white mealiness, which easily rubs off, as in the cabbage leaf and the skin of the plum.

Glabrous—Smooth, having no hairs or warts.

Glomerate—Clustered into a roundish head, as the flowers in *Dactylis glomerata*, and in *Phalaris Canariensis*.

Glumes—The bracts embracing the spikelets; they answer to the calyx of other flowers.

Glumaceous—Resembling glumes; the chaff of grain and grass consists mainly of glumes.

Herbaceous—Tender and herb-like, not woody; usually destructible by frost.

Herbarium—A collection of dried specimens of grasses or other plants.

Hirsute—Rough haired, bearded.

Heteromorphous—Of different forms.

Hybrid—Cross-bred; formed by the union of two allied species.

Hyaline—Transparent, like glass, or partly so.

Indigenous—Growing naturally in a country; not brought from abroad.

Incumbent—Lying upon, against or across.

Inserted—Fixed upon or growing out of.

Internode—The space between the nodes.

Involute—Rolled inward.

Involucre—An assemblage of modified leaves, in place of a calyx, as in *Umbelliferæ* and *Compositæ*.

Imbricate—Lying over broken joints, as shingles or the scales of fishes.

Immarginate—without margins.

Joints—The points where separate pieces cohere.

Keel—A sharp ridge in the middle of a glume or palea resembling the keel of a boat.

Lamina—The expanded portion of the leaf as distinguished from the petiole, or leaf stalk; the blade.

Lanceolate—Tapering gradually by curved lines from the base to the apex.

Lateral—At the side.

Leaflet—The partial leaves of a compound leaf.

Ligneous—Woody.

Ligule—The membranaceous or chartaceous appendage to the lower part of the leaf, or the upper part of the sheaths, in grasses.

Linear—Long and narrow, with parallel sides, like a line.

Locusta—A spikelet or flower cluster in the grasses.

Male flower—A flower that has stamens but not pistils.

Membranaceous—Thin, flexible; generally somewhat translucent.

Monœcius—Having staminate and pistillate flowers distinct, but not on separate plants.

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Monospermous—One seeded.
Mucronate—Abruptly tipped with a minute awn or bristle.
Nerves—Parallel ribs; they are found on the leaves, glumes and paleæ.
Nervation—The arrangement of the nerves.
Neutral flower—Having neither stamens nor pistils.
Nodes—Knots where the separate pieces of the culm are joined.
Nodding—Curved, so that the apex hangs downward.
Normal—As it ought to be; according to a fixed plan.
Obcordate—Heart-shaped at the apex.
Oblique—Having unequal sides.
Oblong—Longer than wide, with the sides nearly parallel.
Obovate—Egg-shaped, with the larger end uppermost.
Obtuse—Blunt.
Opposite leaves—Emerging from opposite sides of the stem in the same horizontal plane.
Orbicular—In, or approaching, the form of an orb.
Ovary—The portion of the flower that contains the ovules.
Ovate—Egg-shaped.
Palea—An inner bract of the grasses, inclosing the caryopsis.
Panicle—A raceme dividing into subordinate branches; a compound raceme.
Pedicel—A partial or subordinate peduncle in compound inflorescence.
Pedicellate—Supported by a pedicel.
Peduncle—A simple flower stalk; also the common flower stalk of compound inflorescence.
Perennial—Living for more than two years, or for an indefinite period.
Petiole—The stem of a leaf.
Pistil—The central organ of a fertile flower usually consisting of an ovary, style and stigma; sometimes the style is wanting.
Pistillate—Having pistils, but not stamens.
Plumose—Feather-like.
Plumule—The ascending axis of a germinating plant.
Pollen—The fertilizing powder contained in the anthers.
Primary branches—The first branches; those which support the secondary branches.
Procumbent—Lying on the ground without putting forth roots.
Pubescent—Clothed with downy hairs.
Raceme—A mode of flowering on an elongated axis having the flowers on short lateral pedicels.
Rachis—The common peduncle upon which the flowers of grasses are arrayed.
Racemose—Having the flowers in racemes.
Radical leaves—Leaves growing from the root.
Retrorse—Pointing backward or downward.
Revolute—Rolled backward or outward.
Ribs—Parallel ridges or nerves on the leaves, paleæ and glumes.
Rugose—Wrinkled.
Rootlet—A secondary capillary root, not a principal root.
Spikelet—A little spike in compound inflorescence, the flowers subtended by one pair of glumes.
Scabrous—Rough, with small points or hairs.
Scarious—Dry, skinny, generally transparent.
Scale—A small thin plate, an altered leaf.
Secund—One-ranked, the flowers all on one side.

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Serrate—Having teeth like those of a saw upon the margin pointing to the apex.
Serrulate—Finely serrate, having small teeth.
Serotinus—Flowering or fruiting late in the season.
Sessile—Sitting, not stalked.
Semi-verticillate—Half whorled; when the branches emanate from half the circumference of the culm.
Setaceous—Like a bristle; bristly.
Sheath—A membraneous expansion which embraces the stem.
Spatulate—Shaped like a spatula; rounded at the end, tapering at the base.
Spike—The flowers being sessile on the rachis form the spike.
Spicate—In the form of a spike.
Squamulæ—Minute scales, two or three in number at the base of the ovary in grasses.
Stamens—The organ of a flower which contains the pollen, and generally consists of the filament and the anthers.
Staminate } Barren; when applied to flower it means one that is without pistils.
Sterile }
Stigma—The roughened end of the pistil which receives the pollen.
Striated—Marked with longitudinal furrows.
Strigose—Having spreading bristly hairs, or scale-like bristles.
Sub-cæspitose—Partially bunchy.
Subulate—Shaped like a shoemaker's awl, narrow and tapering to a sharp point.
Sulcate—Furrowed or grooved longitudinally.
Style—The column between the ovary and stigma of the pistil; it is sometimes wanting, when the stigma is said to be sessile.
Terete—Round, generally tapering from below upward.
Ternate—In threes.
Terminal—Belonging to the summit.
Toothed—Edged with projections which appear like teeth.
Trichotomous—Branched into threes; having three equal forks.
Tricuspidate—Terminating in three sharp points.
Triandrous—Having three stamens.
Tristichous—In three vertical ranks.
Triquetrous—Having three salient angles.
Truncate—Abruptly cut off at the end.
Utricle—A thin membranaceous sac which covers the seed without adhering to it.
Versatile—An anther is said to be versatile when it adheres to the summit of the filament by its middle; swaying backward and forward.
Vagina—The sheath of a leaf.
Vaginate—Sheathed.
Verrucose—Warty, covered with wart-like excrescences.
Verticillate—Whorled.
Ventricose—Bellied; swelled out in the middle.
Villous—Velvety, clothed thickly with soft hairs.
Virgate—Wand-like.
Whorl—A number of leaves or flowers ranged around a stem in the same plane with each other.

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EXPLANATION OF THE FIGURES.

Fig. 1.—Diagram of a simple-stemmed plant, and of the similar parts, or phytons, *a* to *g*, of which it is composed. (Gray.)

Fig 2.—Piece of a stalk, with the sheathing basis of the leaves, of a sedge-grass (Carex crus-corvi), showing the three-ranked arrangement. (Gray.)

Fig. 3.—Poa annua, common annual meadow grass. Fig. 4, spikelet of same magnified; Fig. 5, floret magnified; Fig. 6, calyx magnified; Fig. 7, parts of the flower magnified. (Parnell.)

Fig. 8.—Rottbollia filiformis. (Parnell.)

Fig. 9.—Catabrosa aquatica (Var.) litoralis. (Parnell.)

Fig. 10.—Phleum pratense (Var.) longiaristatum. (Parnell.)

Fig. 11.—Phleum pratense (Var.) longiciliatum. (Parnell.)

Fig, 12.—Paleæ of Bromus mollis, magnified. (Parnell.)

Fig. 13.—Paleæ of Bromus racemosus, magnified. (Parnell.)

Fig. 14.—Paleæ of Trisetum pratense, magnified. (Parnell.)

Fig. 15.—Dactylis cæspitosa, Tussac grass. (Morton's Enc. of Ag.)

Fig. 16.—Vertical and transverse section of a young endogenous stem, showing the curving of the fibres. (Gray.)

Fig. 17.—Portion of the stem of the soft maple (Acer dasycarpum), one year's growth, magnified, showing the cellular pith surrounded by the wood, and that enclosed by the bark. (Gray.)

Fig. 18.—Slice of the same more magnified; *a*, part of the pith; *b*, vessels of the medullary sheath: *c*, the wood; *d d*, dotted ducts in the wood; *e e*, annular ducts; *f*, the liber, or inner fibrous bark; *g*, the cellular envelope, or green bark; *h*, the corky envelope; *i*, the skin, or epidermis; *k*, one of the medullary rays, seen on the transverse section. (Gray.)

Fig 19.—Vertical section of a grain of Indian corn, passing through the embryo; *c*, the cotyledon; *p*, the plumule; *r*, the radicle. (Gray.)

Fig. 20.—Embryo of sugar maple as coiled up in the seed. (Gray.)

Figs. 21, 22.—The same just beginning to unfold and develop in germination; *a*, the radicle, or primary stem; *b b*, the cotyledons or seed leaves.

Fig. 23.—Panicle of Leersia oryzoides. (Gray.)

Fig. 24. Branchlet of the same, with its spikelets of the natural size.

Fig. 24*a*.—An open spikelet of the same in flower, enlarged.

Figs. 24*b*, 24*c*, 24*d*, 24*e*.—Zizania aquatica; *b*, staminate, *c*, pistillate flower or spikelet; *d*, magnified pistil, with a pair of squamulæ or hypogynous scales; *e*, a grain. (Gray.)

Figs. 25–28.—Alopecurus; Fig. 25, glumes; 26, the palea, awn and stamens; 27, a complete spikelet; 28, the palea seen from the inside. Fig. 27 is of the natural size, the others are magnified. (Parnell.)

Fig. 29.—Meadow foxtail. (Flint.)

Fig. 29*a*.—Alopecurus geniculatus, calyx and awn; Fig. 29*b*, palea. (Parnell.)

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Fig. 30.—Phleum pratense, closed glume magnified; Fig. 31, the paleæ, the inner palea being drawn out; Fig. 32, a spikelet of the natural size. (Parnell.)

Fig. 33.—Phleum pratense. (Morton's Enc. of Agr.)

Fig. 33*a*. Phleum alpinum; Fig. 33*b*, glumes; Fig. 33*c*, palea. (Parnell.)

Fig. 33*d*.—Enlarged spikelet of Vilfa vaginæflora; Fig. 33*e*, the same fully opened. (Gray.)

Fig. 33*f*.—Spikelet of Sporobolus cryptandrus, magnified; Fig. 33*g*, the same with the flower open, and the palea raised above the glumes; Fig. 33*h*, the fruit, showing the seed loose in the utricle. (Gray.)

Figs. 34–36.—Agrostis canina; 34, the glumes; 35, the paleæ; 36, the stem and panicle. (Parnell.)

Fig. 37.—Agrostis vulgaris (Darlington); Fig. 37*a*, glumes; Fig. 37*b*, paleæ, both enlarged. (Parnell.)

Fig. 38.—Palea, Fig. 39, glumes of Agrostis alba. (Parnell.)

Fig. 40.—Agrostis stolonifera; Fig. 40*a*, glume enlarged; Fig. 40*b*, palea enlarged; Fig. 40*c*, floret, natural size. (Parnell.)

Fig. 41.—Polypogon monspeliensis, glumes; Fig. 42, palea; Fig. 42*a*, spikelet, natural size; Fig. 43, culm and panicle. (Parnell.)

Fig. 43*a*.—Magnified spikelet of Cinna arundinacea; Fig. 43*b*, the same open, displaying the organs. (Gray.)

Fig. 43*c*.—Magnified closed spikelet of Muhlenbergia sylvatica; Fig. 43*d*, glumes and paleæ. (Gray.)

Fig. 43*e*.—Magnified spikelet of Muhlenbergia diffusa; Fig. 43*f*, glumes; Fig. 43*g*, paleæ. (Gray.)

Fig. 43*h*.—Brachyelytrum aristatum, closed spikelet; Fig. 43*i*, open spikelet. (Gray.)

Fig. 44.—The glume of Calamagrostis Canadensis; Fig. 45, paleæ; Fig. 46, stigma and ovary; Fig. 47, the culm and panicle. (Torrey.)

Fig. 48.—Calamagrostis confinis, glumes; Fig. 49, paleæ; Fig. 50, rudimentary flower; Fig. 51, culm and panicle. (Torrey.)

Fig. 52.—Calamagrostis coarctata, glume; Fig. 53, paleæ; Fig. 54, rudimentary flower; Fig. 55, culm and panicle. (Torrey.)

Fig. 56.—Calamagrostis arenaria, spikelet; Fig. 57, glumes; Fig. 58, paleæ; Fig. 58*a*, culm and panicle. (Parnell.)

Fig. 58*b*.—Oryzopsis asperifolia, magnified spikelet open; Fig. 58*c*, the flower lifted out of the glumes. (Gray.)

Fig. 58*d*.—Stipa avenacea, glumes and flower enlarged. (Gray.)

Fig. 59.—Stipa pennata, glume; Fig. 60, paleæ and feathered awn; Fig. 61, ovary, squamulæ, stamens and pistils; Fig. 62, the entire plant. (Parnell.)

Fig. 63.—Aristida dichotoma; Fig 64, magnified spikelet of the same. (Torrey.)

Fig. 64*a*.—Aristida purpurascens, magnified spikelet. (Gray.)

Fig. 65.—Spartina cynosuroides, spikelet; Fig. 66, lower palea; Fig. 67, flower, with glumes and paleæ removed; Fig. 68, the entire plant. (Torrey.)

Fig. 69.—Spartina stricta, enlarged spikelet; Fig. 70, the flower lifted out of the glumes (Gray); Figs. 71, 71*a*, the entire plant. (Parnell.)

Fig. 72.—Spartina stricta (var.) alternifolia, glumes; Fig. 73, paleæ; Fig. 74, ligule; Fig. 75, culm and panicle. (Parnell.)

Fig 75*a*.—Ctenium Americanum, spike, natural size; Fig. 75*b*, a spikelet enlarged; Fig 75*c*, the flower raised out of the glumes. (Gray.)

Fig. 75*d*.—Bouteloua curtipendula; Fig. 75*e*, an enlarged branch and spikelets; Fig. 75*f*, glumes, and flowers lifted out of them. (Gray.)

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Fig. 75*g*.—Gymnopogon racemosus (reduced size); Fig. 75*h*, the magnified spikelet showing glumes and paleæ. (Gray.)

Fig. 76.—Cynodon dactylon, spikelet; Fig. 77, magnified branch; Fig. 78, paleæ and rudiment; Fig. 79, hairy ligule; Fig. 80, the plant, natural size. (Parnell.)

Fig. 80*a*.—Dactyloctenium Ægyptiacum; Fig. 80*b*, spikelet magnified; Fig. 80*c*, the fruit magnified, showing the seed loose in the thin utricle; Fig. 80*d*, the wrinkled seed more magnified. (Gray.)

Fig. 80*e*.—Eleusine Indica, spike natural size; Fig. 80*f*, magnified spikelet; Fig. 80*g*, the same with the flowers more displayed; Fig. 80*h*, the paleæ, ovary and pistils; Fig. 80*i*, the fruit magnified, showing the seed loose in the utricle; Fig. 80*k*, the wrinkled seed detached. (Gray.)

Fig. 80*l*.—Leptochloa fascicularis, portion of a branch; Fig. 80*m*, spikelet displayed and magnified; Fig. 80*n*, open flower, showing the notched paleæ. (Gray.)

Fig. 81.—Tricuspis sesleroides, spikelet enlarged; Fig. 82, upper glume; Fig. 83, lower glume; Fig. 84, paleæ; Fig. 85, culm and panicle. (Torrey.)

Fig. 85*a*.—Dupontia Cooleyi, magnified spikelet; Fig. 85*b*, part of the hairy rachis and one flower of the same. (Gray.)

Fig. 85*c*.—Diarrhena Americana, spikelet enlarged; Fig. 85*d*, the grain and paleæ. (Gray.)

Fig. 86.—Dactylis glomerata, glumes, and Fig. 87, paleæ, magnified; Fig. 88, spikelet, natural size; Fig. 89, culm and panicle. (Parnell.)

Fig. 90.—Kœleria cristata, glumes; Fig. 91, the two flowers with their paleæ magnified; Fig. 92, the whole plant; Fig. 92*a*, ovary and pistils.

Fig. 93. Eatonia obtusata, magnified spikelet (Gray); Fig. 94, paleæ magnified; Fig. 94*a*, culm and panicle. (Torrey.)

Fig. 95.—Melica mutica, a magnified spikelet. (Gray.)

Fig. 96.—Glyceria nervata, culm and panicle (Flint); Fig. 96*a*, spikelet magnified; Fig. 96*b*, a separate flower, with one joint of the rachis; Fig. 96*c*, the lower half of a lower palea. (Gray.)

Fig. 97.—Glyceria pallida, spikelet; Fig. 98, lower palea; Fig. 98*a*, a flower; Fig. 99, upper palea; Fig. 100, culm and panicle. (Torrey.)

Fig. 101.—Glyceria aquatica, glumes magnified; Fig. 102, paleæ magnified; Fig. 102*a*, spikelet, natural size; Fig. 103, culm and panicle. (Parnell.)

Fig. 104.—Glyceria fluitans, and Fig. 105, paleæ, magnified; Fig. 106, spikelet, natural size; Fig. 107, culm and panicle. (Parnell.)

Fig. 108. Glyceria maritima, glumes; Fig. 109, paleæ; Fig. 110, culm and panicle. (Parnell.)

Fig. 110*a*.—Glyceria distans, glumes, and Fig. 110*b*, paleæ, enlarged; Fig. 110*c*, spikelet natural size; Fig. 110*d*, culm and panicle. (Parnell.)

Fig. 110*e*.—Brizopyrum spicatum, pistillate spikelet; Fig. 110*f*, a flower from the same; Fig. 110*g*, a flower from a staminate spikelet. (Gray.)

Fig. 110*h*.—Poa laxa, glumes; Fig. 110*i*, paleæ; Fig. 110*k*, outer palea of lowermost floret; Fig. 110*l*, the whole plant. (Parnell.)

Fig. 111.—Poa alsodes, glumes; Fig. 112, floret; Fig. 113, lower palea; Fig. 114, culm and panicle. (Parnell.)

Fig. 115.—Poa serotina, spikelet; Fig. 116, paleæ; Fig. 117, culm and panicle. (Flint.)

Fig. 118.—Poa trivialis, glumes; Fig. 119, paleæ; Fig. 120, culm and panicle. (Parnell.)

Fig. 121.—Poa pratensis, glumes; Fig. 122, paleæ; Fig. 123, lower palea; Fig. 124, ovary and appendages; Fig. 125, culm and panicle. (Parnell.)

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Fig. 126.—Poa compressa, glume; Fig. 127, upper palea; Fig. 128, lower palea; Fig. 129, culm and panicle. (Parnell.)

Fig. 129*a*.—Eragrostis pilosa, spikelet enlarged; Fig. 129*b*, spikelet from which the glumes and all of six lower flowers, except the upper paleæ, have fallen away; Fig. 129*c*, a magnified flower open; Fig. 129*d*, the lower palea of the same outspread. (Gray.)

Fig. 130.—Briza media, glumes; Fig. 131, paleæ; Fig. 131*a*, ovary, squamulæ. stamens and pistils; Fig. 132, culm and panicle. (Parnell.)

Fig. 133.—Festuca tenella, a magnified spikelet; Fig. 134, the whole plant. (Torrey.)

Fig. 135.—Festuca ovina, glumes; Fig. 136, paleæ; Fig. 137, the whole plant. (Parnell.)

Fig. 138.—Festuca ovina (var.) vivipara, glumes; Fig. 138*a*, the palea, with the rest of the flower converted into a leafy shoot; Fig. 138*b*, the whole plant. (Parnell.)

Fig. 139.—Festuca elatior, glumes; Fig. 140, paleæ, magnified; Fig. 141, culm and panicle. (Parnell.)

Fig. 142.—Festuca nutans, lower palea; Fig. 143, upper palea; Fig. 144, the whole plant. (Torrey.)

Fig. 144*a*.—Bromus secalinus, glumes; Fig. 144*b*, paleæ; Fig. 144*c*, lower palea (all enlarged); Fig. 144*d*, a spikelet; Fig. 144*e*, culm and panicle. (Parnell.)

Fig. 145.—Bromus racemosus, spikelet; Fig. 146, glumes; Fig. 147, floret, showing outer and inner paleæ; Fig. 148, outer palea, showing the seven ribs; Fig. 149, inner palea, fringed; Fig. 150, ligule, serrated; Fig. 151*a*, ovary, pistils, stamens and scales (all magnified); Fig. 151, the entire plant. (Parnell.)

Fig. 152.—Bromus mollis; glumes, and Fig. 153, paleæ, enlarged; Fig. 154, culm and panicle; Fig. 154*a*, spikelet, and Fig. 154*b*, reproductive organs. (Parnell.)

Fig. 154*c*.—Bromus sterilis; glume, and Fig. 154*d*, paleæ and awn, enlarged; Fig. 154*e*, culm and panicle. (Parnell.)

Fig. 154*f*.—Uniola latifolia, spikelet about natural size; Fig. 154*g*, a flower, and Fig. 154*h*, empty lower palea of the lowest (sterile) flower, enlarged. (Gray.)

Fig. 155.—Phragmites communis, glumes; Fig. 156, paleæ and hairs; Fig. 157, culm and panicle. (Parnell.)

Fig. 157*a*.—Arundinaria macrosperma, spikelet, and Fig. 157*b*, flower, magnified. (Gray.)

Fig. 157*c*.—Lepturus paniculatus, portion of the spike, enlarged; Fig. 157*d*, flower, magnified. (Gray.)

Fig. 158.—Lolium perenne; Fig. 159, the one glumed calyx; Fig. 160, the paleæ. (Parnell.)

Fig. 161.—Lolium Italicum. (Parnell.)

Fig. 161*a*.—Lolium temulentum; Fig. 161*b*, single glume; Fig. 161*c*, paleæ and awn. (Parnell.)

Fig. 162.—Triticum repens; Fig. 163, glumes, and Fig. 164, paleæ, enlarged; Fig. 164*a*, lower glume spread out. (Parnell.)

Fig. 164*b*.—Triticum caninum; Fig. 164*c*, glumes; Fig. 164*d*, palea and awn, and Fig. 164*e*, lower glume with hairs (enlarged). (Parnell.)

Fig. 164*f*.—Hordeum jubatum, three one-flowered spikelets; Fig. 164*g*, perfect flower. (Gray.)

Fig. 164*h*.—Elymus Virginicus, the two spikelets of one joint, about natural size; Fig. 164*i*, the glumes and flowers of one spikelet enlarged; Fig. 164*k*, an open flower more magnified. (Gray.)

Fig. 164*l*.—Gymnosticum Hystrix, spikelet; Fig. 164*m*, an expanded flower, magnified (Gray.)

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Fig. 165.—Aira flexuosa; Fig. 166, glumes, and Fig. 167, paleæ and awns of both flowers, enlarged; Fig. 167*a*, spikelet, natural size. (Parnell.)

Fig. 168.—Aira cæspitosa; Fig. 169, glumes, and Fig. 170, paleæ and awns of both flowers, enlarged; Fig. 170*a*, spikelet, natural size. (Parnell.)

Fig. 171.—Danthonia spicata, panicle; Fig. 171*a*, spikelet, enlarged; Fig. 171*b* separate flower from the same, enlarged; Fig. 171*c*, lower palea with hairs and twisted awn. (Gray.)

Fig. 171*d*.—Danthonia compressa, root leaves; Fig. 171*e*, upper part of the culm with leaves and panicle; Fig. 171*f*, the spikelet inclosed in the glumes, enlarged; Fig. 171*g*, the spikelet after being stripped of the glumes; Fig. 171*h*, the lower glume pressed flat, and Fig. 171*i*, the upper glume pressed flat, both showing the nerves; Fig. 171*k*, the upper and lower paleæ; Fig. 171*l*, the back of the lower palea, showing the bifid apex and the twisted awn; Fig. 171*m*, the upper palea with the two marginal nerves.

Fig. 172.—Trisetum subspicatum; Fig. 173, a spikelet enlarged; Fig. 174, a rudimentary flower enlarged. (Torrey.)

Fig. 174*a*.—Avena striata; a spikelet displayed and magnified; Fig. 174*b*, a flower of the same, enlarged. (Gray.)

Fig. 175.—Avena præcox; Fig. 176, glumes, enlarged; Fig. 177, flowers, paleæ and awns. (Parnell.)

Fig. 178.—Arrhenatherum avenaceum; Fig. 179, glumes, and Fig. 180, the flowers, paleæ and awns, enlarged; Fig. 181, a spikelet, natural size. (Parnell.)

Fig. 182.—Holcus lanatus; Fig. 183, glumes, and Fig. 184, flowers, paleæ and curved awn, enlarged; Fig. 185, spikelet, natural size; Fig. 185*a*, curved awn, magnified. (Parnell.)

Fig. 186.—Hierochloa borealis; Fig. 187, glumes, and Fig. 188, paleæ, enlarged; Fig. 189, spikelet, natural size; Fig. 189*a*, ovary, squamulæ, stamens and pistils, magnified. (Parnell.)

Fig. 190.—Anthoxanthum odoratum; Fig. 191, glumes; Fig. 192, paleæ; Fig. 193, spikelet, natural size; Fig. 193*a*, ovary, stamens and pistils. (Parnell.)

Fig. 194.—Phalaris arundinacea; Fig. 195, glumes, and Fig. 196, paleæ and rudimentary flowers, enlarged; Fig. 197, spikelet, natural size. (Parnell.)

Fig. 198.—Phalaris canariensis; Fig. 199, glumes, and Fig. 200, paleæ and rudimentary flowers, enlarged; Fig. 200*a*, glumes, natural size. (Parnell.)

Fig. 201.—Milium effusum; Fig. 202, glumes, and Fig. 203, paleæ, enlarged. (Parnell.)

Fig. 203*a*.—Amphicarpum Purshii, spikelet from the panicle; Fig. 203*b*, the same, with the parts displayed; Fig. 203*c*, a radicle (fertile) spikelet, all enlarged. (Gray.)

Fig. 203*d*.—Inflorescence of Paspalum læve; Fig. 203*e*, a closed spikelet, enlarged; Fig. 203*f*, the same, with the parts displayed. (Gray.)

Fig. 204.—Panicum filiforme; Fig. 205, a pair of spikelets; Fig. 206, glumes and paleæ. (Torrey.)

Fig. 207.—Panicum sanguinale; Fig. 208, spikelets and rachis, enlarged; Fig. 209, spikelet, showing upper glume; Fig. 210, two glumes and two florets, enlarged; Fig. 211, uppermost floret, showing the outer and inner paleæ enlarged; Fig. 212, ligule of upper sheath, showing the hairs at the base; Fig. 212*a*, ovary stamens and pistils. (Parnell.)

Fig. 213.—Panicum agrostoides; Fig. 214, spikelet; Fig. 215, neutral flower; Fig. 216, perfect flower; Fig. 217, transverse section (all enlarged). (Torrey.)

Fig. 217*a*.—Panicum capillare, spikelet; Fig. 217*b*, the same displayed (both enlarged.) (Gray.)

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Fig. 217*c*.—Panicum virgatum, spikelet magnified; Fig. 217*d*, the same displayed. (Gray.)

Fig. 217*e*.—Panicum clandestinum, spikelet magnified; Fig. 217*f*, the same displayed. (Gray.)

Fig. 218.—Panicum xanthophysum; Fig. 219, spikelet enlarged, front view; Fig. 220, the same, back view; Fig. 221, perfect flower; Fig. 222, the same, with palese removed. (Torrey.)

Fig. 223.—Panicum crus-galli; Fig. 224, spikelet; Fig. 225, glumes; Fig. 226, sterile flower; Fig. 227, perfect flower; Fig. 228, ovarium, pistils and stamens (magnified). (Parnell.)

Fig. 229.—Setaria verticillata; Fig. 230, rachis, with spikelets removed, natural size; Fig. 231, glumes; Fig. 232, lowermost flower (single palea); Fig. 233, upper floret; Fig. 234, spikelet, showing the two bristles with reflex teeth, all enlarged; Fig. 235, ligule of upper sheath, natural size. (Parnell.)

Fig. 235*a*.—Setaria glauca, magnified spikelet; Fig. 235*b*, the same displayed. (Gray.)

Fig. 235*c*.—Setaria viridis; Fig. 235*d*, rachis, with spikelets removed; Fig. 235*e*, spikelet enlarged, showing the long bristles with erect teeth; Fig. 235*f*, glumes; Fig. 235*g*, lowermost floret of one palea; Fig. 235*h*, upper floret of two paleæ; Fig. 235*i*, ovary, pistils and stamens; Fig. 235*k*, ligule of upper sheath. (Parnell.)

Fig. 235*l*.—Involucre of Cenchrus tribuloides in flower, enlarged; Fig. 235*m*, longitudinal section of the same; Fig. 235*n*, a spikelet, displayed. (Gray.)

Fig. 235*o*.—Tripsacum dactyloides, a piece of the spike, natural size; Fig. 235*p*, a longitudinal section of one of the pistillate spikelets; Fig. 235*q*, a pistillate spikelet with the parts displayed; Fig. 235*r*, a staminate spikelet (two flowers), with its parts displayed. (Gray.)

Fig. 235*s*.—Erianthus alopecuroides, part of the hairy inflorescence, with its two spikelets, enlarged; Fig. 235*t*, one of the spikelets, displayed. (Gray.)

Fig. 235*u*.—Andropogon furcatus, small portion of the spike, enlarged, with one fertile and awned spikelet, and one staminate and awnless spikelet; Fig. 235*v*, the fertile spikelet, and Fig. 235*w*, the staminate spikelet, displayed. (Gray.)

Fig. 235*x*.—Sorghum nutans; a fertile spikelet with a sterile pedicle on each side, enlarged; Fig. 235*y*, a spikelet, displayed. (Gray.)

Fig. 236.—Buchloë dactyloides, showing the male flower, *a*, and the female flower, *c*, growing on the same plant.

Fig. 237.—The male plant.

Fig. 238.—A magnified view of an unusually short staminate spike, in the position of the pistillate spike (Fig. 242), and with scarcely more spikelets, to show the analogy of both: *a*, the rachis, and immediately above the letter is the larger glume.

Fig. 239.—A two-flowered spikelet, seen from the inside of the spike, so that the lower glume is exhibited, *a*; upper glume, *b*; *c*, *c*, lower paleæ; *d*, *d*, upper paleæ.

Fig. 240.—Terminal spikelet of a spike, with larger lower glume, *a*; upper glume, *b*; *c*, *c*, lower paleæ; *d*, *d*, upper paleæ.

Fig. 241.—Female flower: *d*, *d*, involucral leaves, somewhat opened; *a*, the almost sessile lower flower; *b*, the upper flower; *c*, pedicel of the upper flower. A tuft of short hairs is observed near the letter *c*, at the point of union between the peduncle and the glumes.

Fig. 242.—An elongated head, with five fertile flowers, showing their arrangement in a one sided spike: *a*, the lower glume of the lowest spikelet; *b*, lowest spikelet, as well as *d* and *f*, on the off side of the rachis; *g*, last sterile glume, the rudiment of the sixth flower; *c*, central lobe of glume; *h*, *i*, lateral lobes.

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Fig. 243.—Lower and upper glume of the lowest spikelet of a head in fruit; the upper is attached to the back of the lower glume; *b*, central lobe; *a*, *c*, lateral lobes.

Fig. 244.—One of the other spikelets, seen from the inside of the head, exhibiting the lower glume, part of the upper one, and, *c*, the upper half of the lower palea; *a*, lower glume.

Fig. 245.—Lower palea of the flower: *a*, from the inside, rolled up; *b*, outside, unfolded.

Fig. 246.—Upper palea: *a*, from the inner side, with the stigmata protruding; *b*, same from the back, showing both nerves; *c*, upper palea, including the ripe seed, seen from the inside; scales, *e*, *d*, visible.

Fig. 247.—Different forms of the lower glume: *a*, narrow and obtuse; *d*, foliaceous at the upper half; a very rare occurrence.

Fig. 248.—Vertical section of a fruit-bearing spikelet, exhibiting both glumes (the outer upper one the longest and much thickened), both paleæ and the grain.

Fig. 249.—Ovary much magnified, showing all three rudimentary stamens, *a*, *b*, *c*, with the scales removed.

Fig. 250.—Pistillate plant complete.

Fig. 251.—Grain: *a*, seen from the convex inner side (turned toward the upper palea); *b*, horizontal, and *c*, vertical section of the same; *a* and *b*, more magnified.

Fig. 252.—Ovary, with the styles more magnified. At the base of the ovary, one of the three rudimentary stamens and both scales are visible.

Fig. 253.—Part of a stigmatic hair, highly magnified.

Fig. 254.—Diagram of head, *a* (Fig. 241); the upper head, *b*, has also three fertile flowers, but their arrangement is exactly reversed.

Fig. 255.—Diagram of Fig. 242; the letters correspond.

Fig. 256.—Rachis of three spikelets, with the base of two involucral leaves; in the axis of the lower one a bud.

Fig. 257.—Lower palea of the fruit: *a*, from the inside, folded around the upper palea, both dorsal nerves of which are visible; *b*, the same, unfolded.

Fig. 258.—Scales: *a*, truncate; *b*, emarginate-bilobed, more magnified.

Fig. 259.—Diagram of Fig. 238.

Fig. 260.—A triflower spikelet of the staminate flower.

Fig. 261.—Flower of male plant, open, with the stamens.

Fig. 262.—Small stalks with male spikes.

Fig. 263.—Different forms of lower glume, male plant.

Fig. 264.—*a*, *b*, *c*, same, of upper glume; *d* shows an upper glume with a secondary nerve; a rare occurrence, found occasionally in specimens from Fort Kearney.

Fig. 265.—Lower palea, *a*, of the lower flower, midrib running out into a point; *b*, of the upper flower, blunt.

Fig. 266.—Upper palea, male flower: *a*, from the inside and partly folded, showing also the scales; *c*, the same from the upper flower, both nerves at point much closer than in the lower flower.

Fig. 267.—Monanthochloë litoralis, female plant in flower; here and there the small spikelets are recognized by the protruding stigmata. (Natural size; all the other figures following are magnified.)

Fig. 268.—Top of a stem of the same plant, showing the manner of ramification, the different leaves, the bifid scales which form the lowest leaf of each branch toward the stem, and which correspond to the upper paleæ. The figure shows the lower stem leaves, which have no branches in their axils, with smaller, narrower sheaths, while the upper branch-bearing leaves have large ventricose sheaths.

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Fig. 269.—Male flower: Spikelet, consisting of the foliaceous lower palea, including an hyaline scale and two flowers.

Fig. 270.—Single flower, open, showing the stamens.

Fig. 271.—Spikelet with first and second flowers neutral, and both upper ones staminate.

Fig. 272.—Top of a branch exhibiting the uppermost leaf, *a*, with an axillary branch, composed of the lowest bifid, *b*, and two regularly formed leaves; the lower palea of the lowest flower, *c*, is less foliaceous than usual; upper palea of same divided in two thin scales, *d*, *d*, lateral to the flowers; three staminate flowers, *e*, *f*, *g*.

Fig. 273.—Diagram of same.

Fig. 274. Diagram of a similar spikelet, in which both parts of the upper palea are hidden in the cavity of the lower one; second flower reduced to a single hyaline scale; third and fourth flower staminate; fifth, rudimentary.

Fig. 275.—Diagram of another spikelet, in which the lowest flower is reduced to a single herbaceous lower palea, the second one to a small membranaceous scale, corresponding to an upper palea; third and fourth flowers staminate, and fifth rudimentary.*

* The figures illustrating *Buchloë dactyloides* and *Monanthochloë littoralis* are copied from those of Dr. George Engelmann, in Trans. Acad. of Science of St. Louis, vol. 1.

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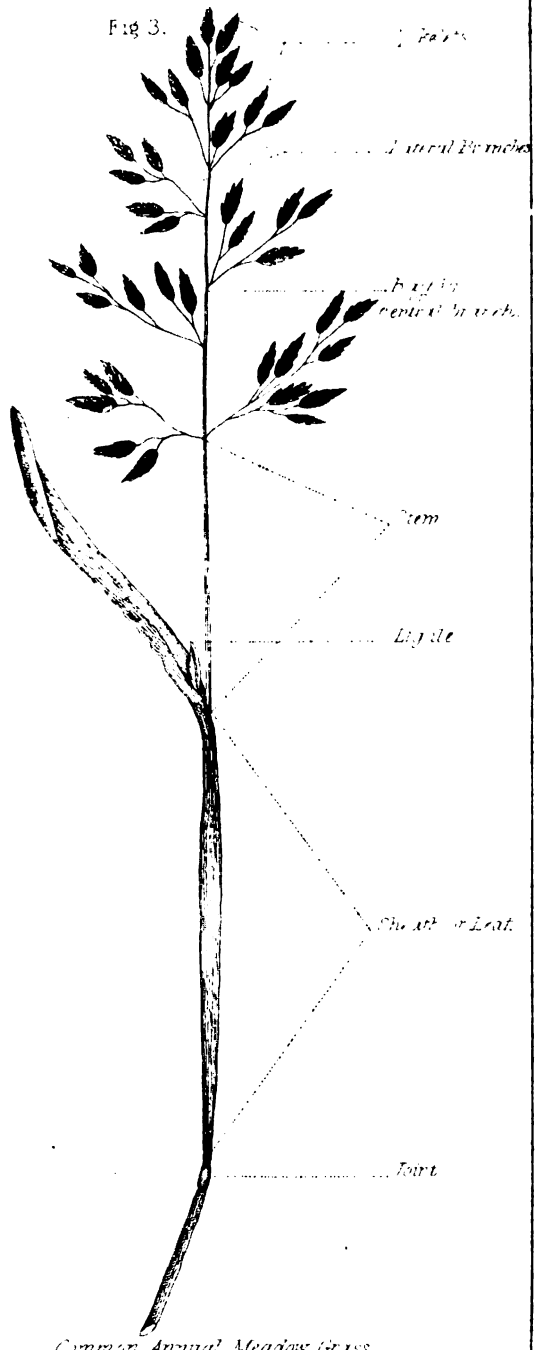
Fig 1.

Fig 2.

Fig 3.



Common Annual Meadow Grass

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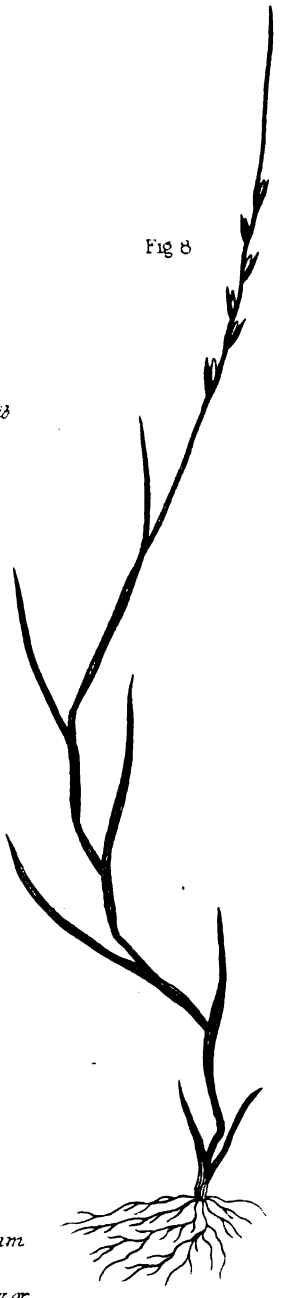
Fig 4.

Spikelet magnified.

Fig 8

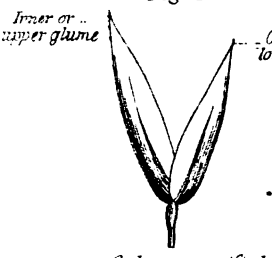


Rottbollia filiformis

Fig 5.

Floret magnified.

Fig. 6



Calyx magnified.

Fig 7

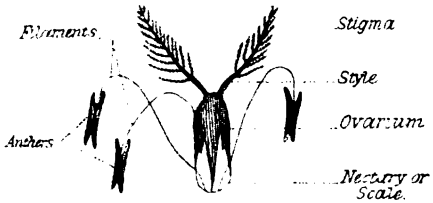


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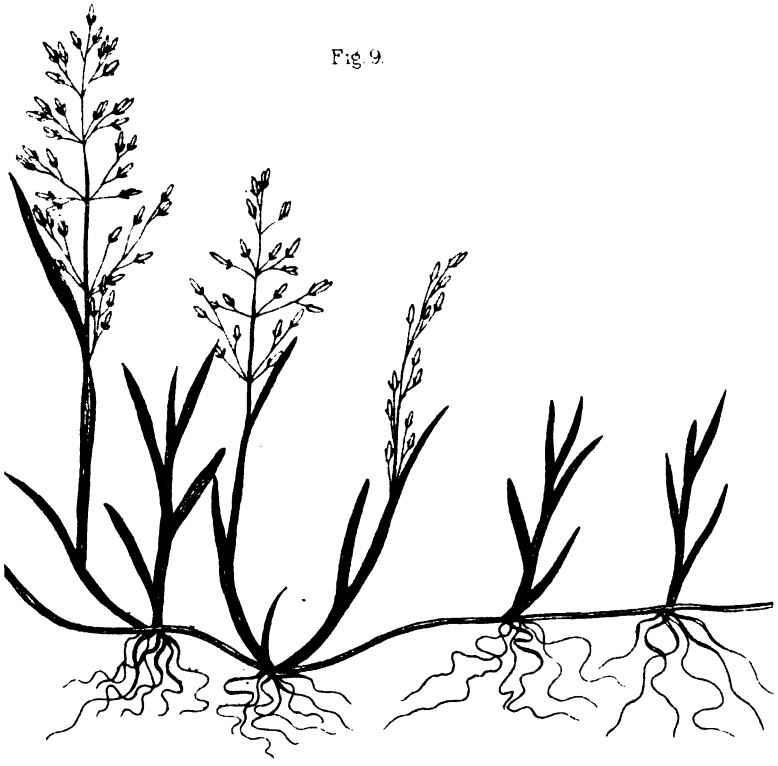
Fig 9.



Catabrosa aquatica (var) littoralis.

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Fig 10.

Phelum pratense (var.) longiarestatum.

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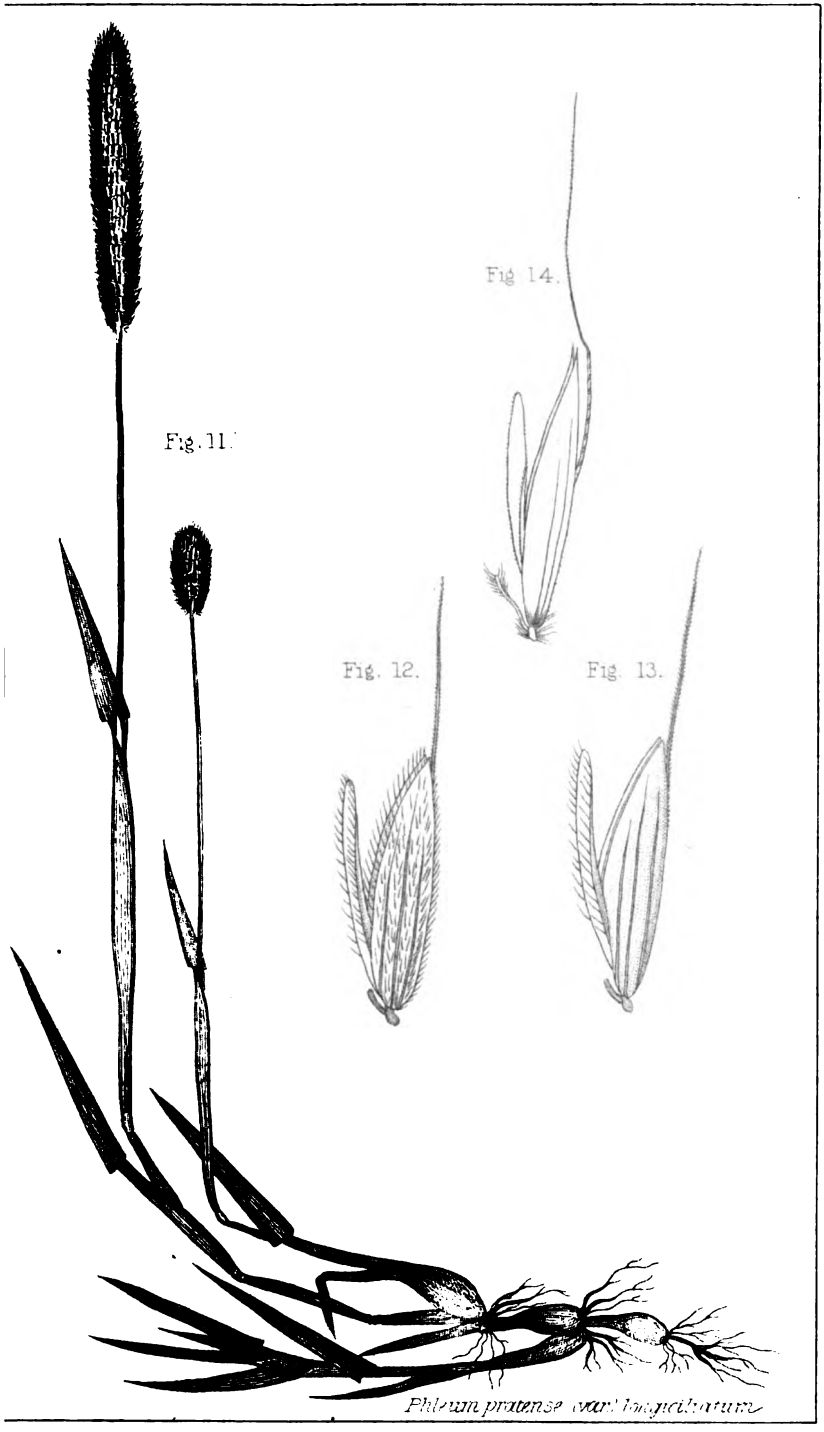

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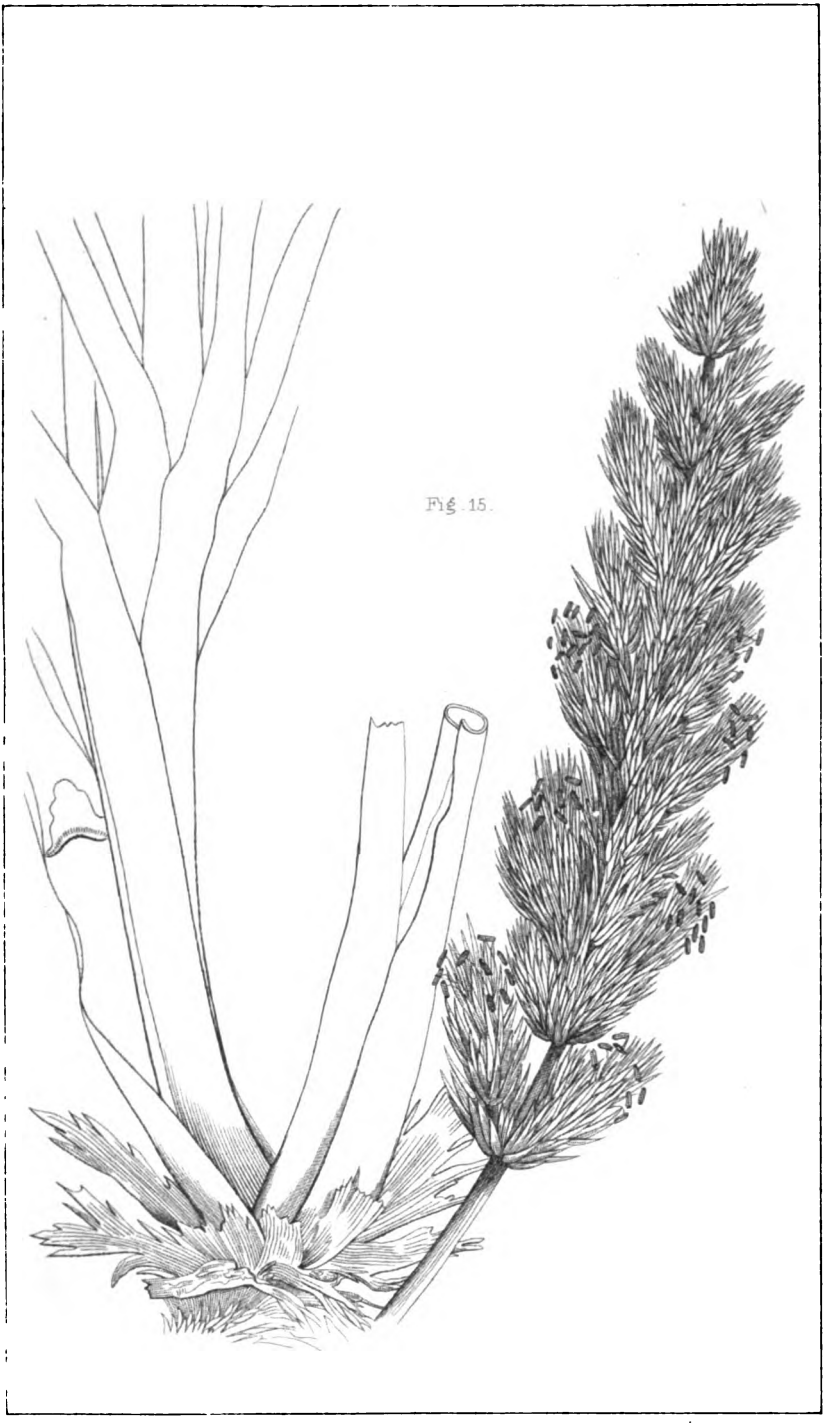

Fig. 15.

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Fig 16

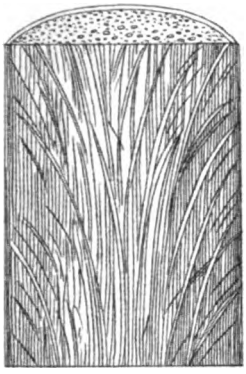
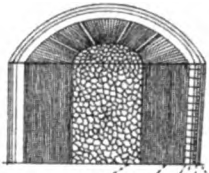


Fig. 17.



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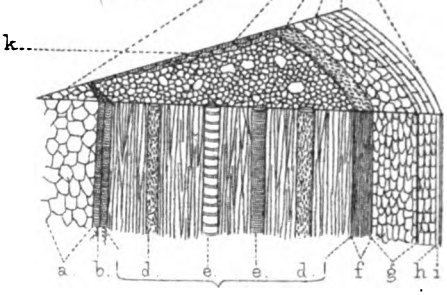

Fig 19.

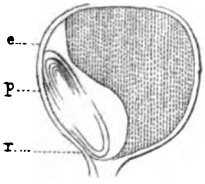

Fig. 20.

Fig. 21.

Fig. 22.

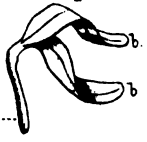

Fig. 23.

Fig. 24.

Fig. 24. a.

Fig. 24. c.

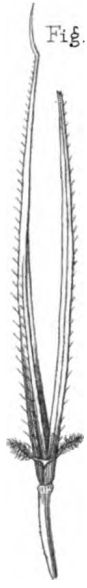

Fig. 24. b.

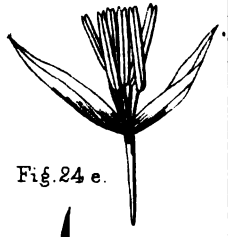

Fig. 24 e.

Fig. 24. d.

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Fig. 25.

Fig. 27.

Fig. 26.

Fig. 28.

Fig. 29.

Meadow Foxtail

Fig. 29 a.

Fig. 29 b.

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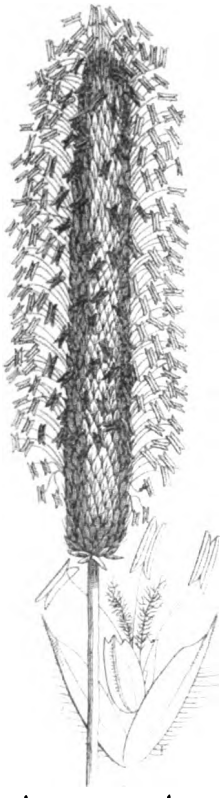

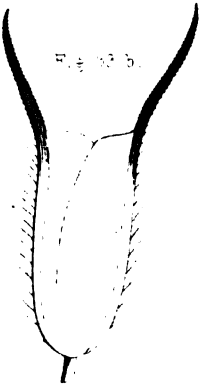

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Fig. 33 d

Fig. 33 e

Fig. 33 f

Fig. 33 g

Fig. 33 h

Fig. 34

Fig. 35

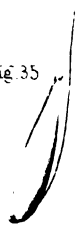
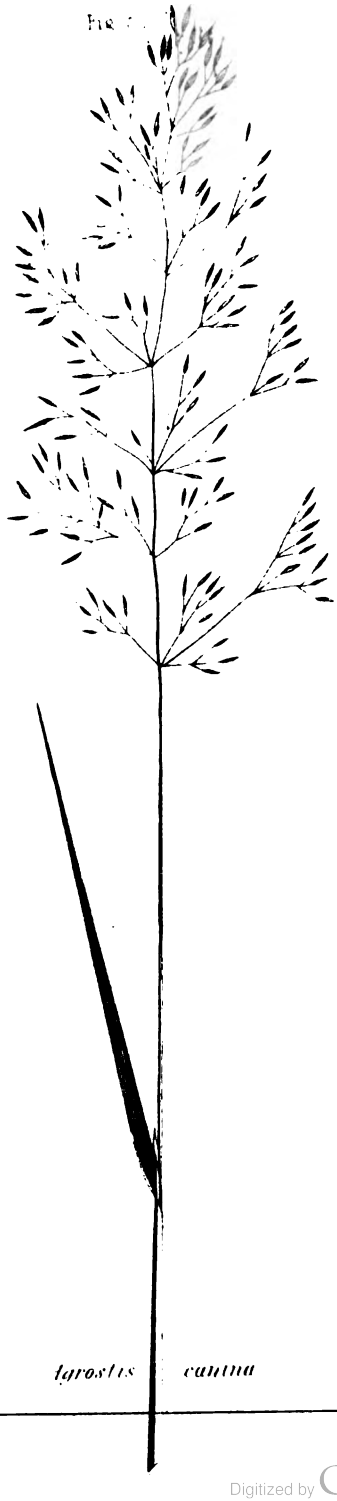


Fig. 36



Agrostis cantina

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Fig 37

Fig 37.a

Fig 37 b

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Fig 40

Fig 40 a.

Fig 40 b

Fig 40

Fig 38

Fig 39.

Agrostis stolonifera.

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Fig. 43.

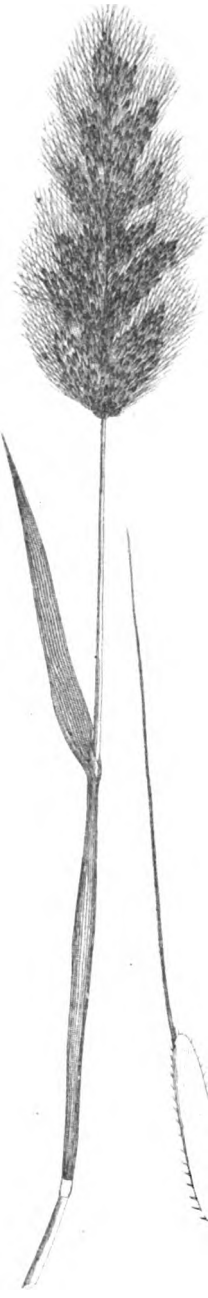

Fig. 42.

Fig. 42 a.

Fig. 41.

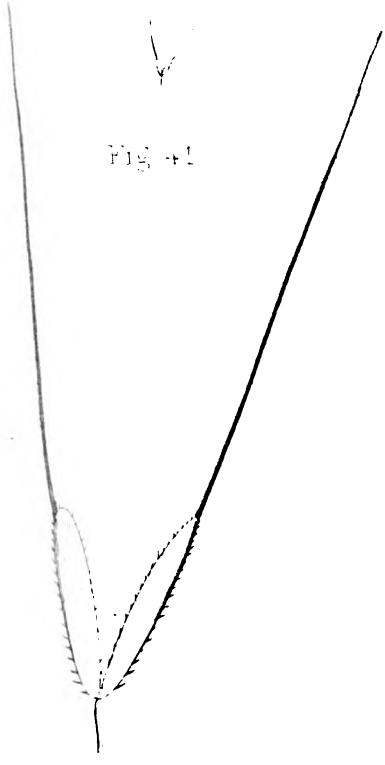

Fig. 43 a.

Fig. 43 b.

Polypogon monspeliensis.

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Fig 43 a.

Fig 43 d.

Fig 43 e.

Fig 43 g.

Fig 43 f.

Fig 43 b.

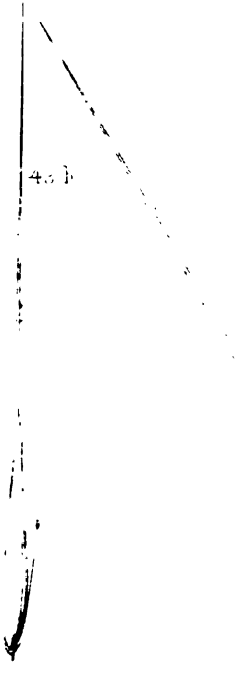

Fig 43 c.

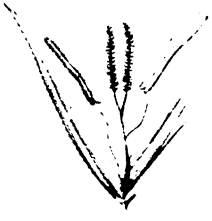

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Fig. 58 a

Fig. 58 b

Fig. 56

Fig. 58 c

Fig. 57

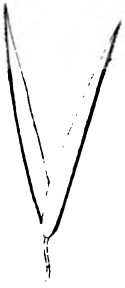

Fig. 58 d

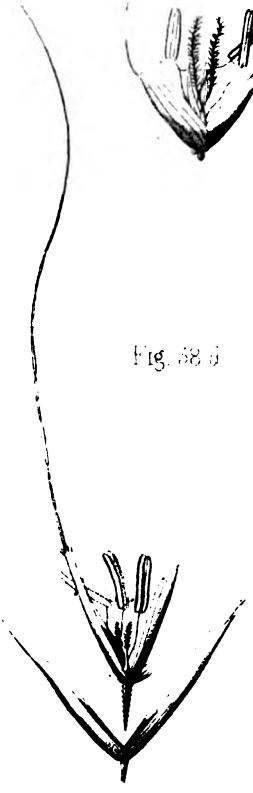

Fig. 58

Calamagrostis arenaria.

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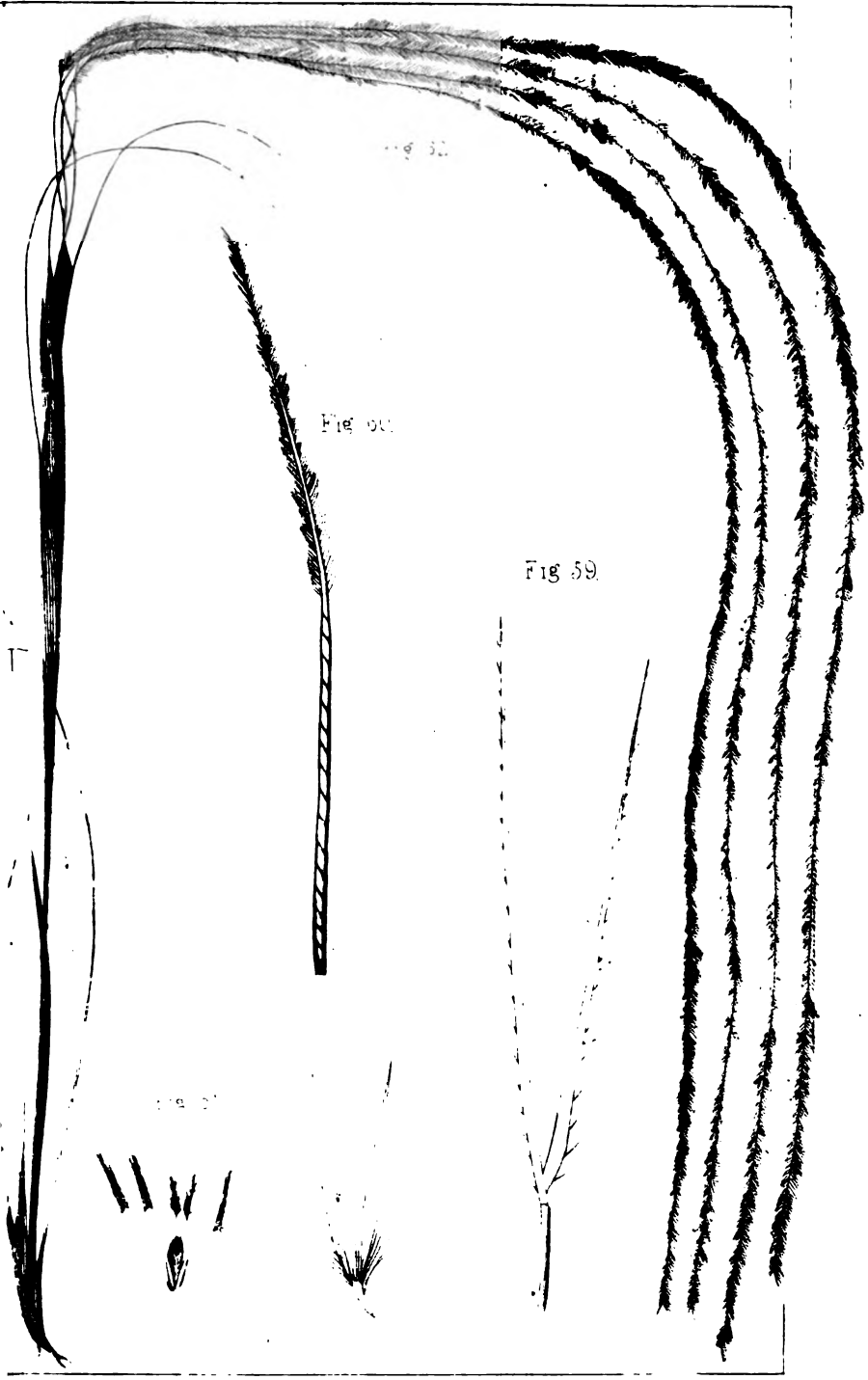

Fig 59.

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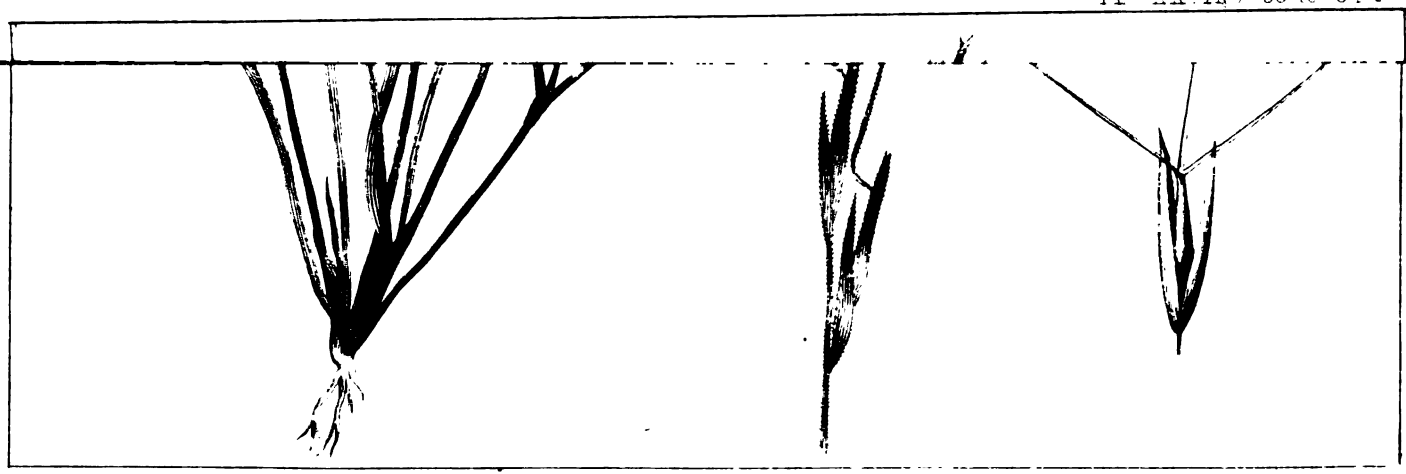
Pl. XX. Figs. 63 to 64 a



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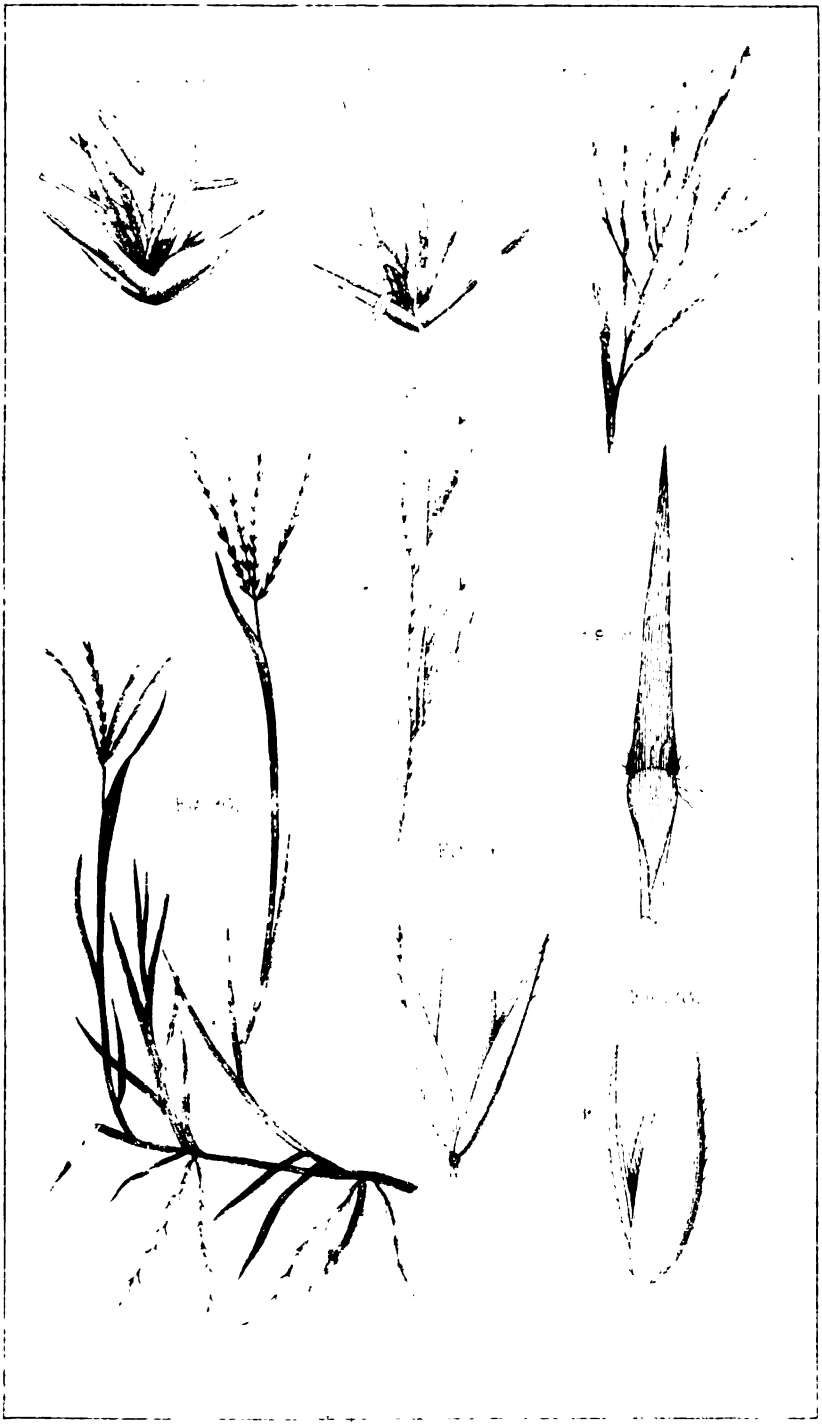

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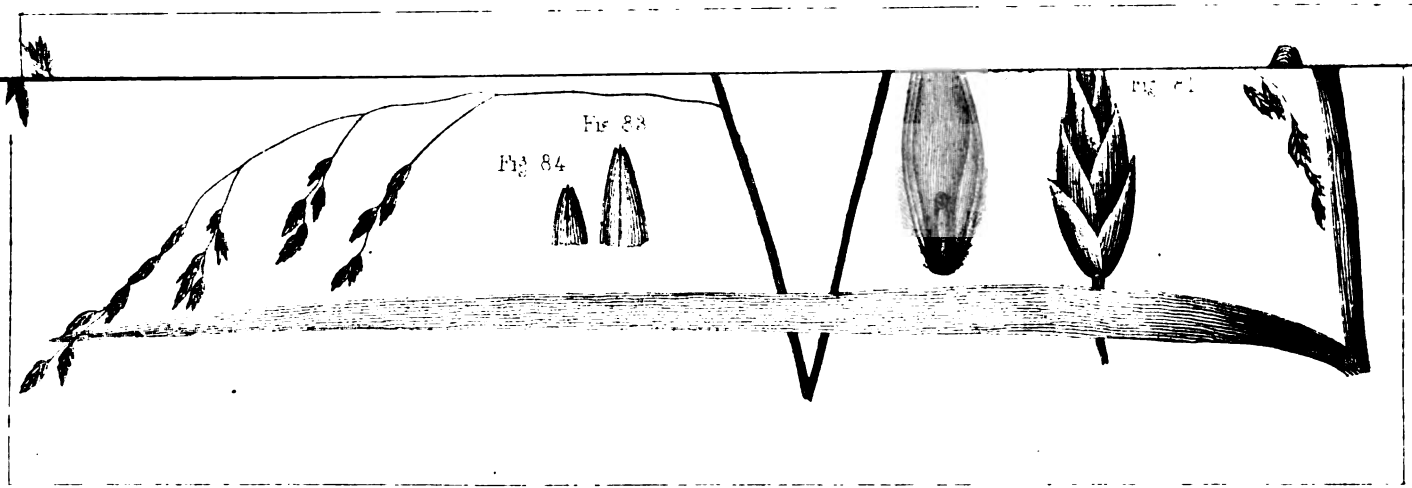

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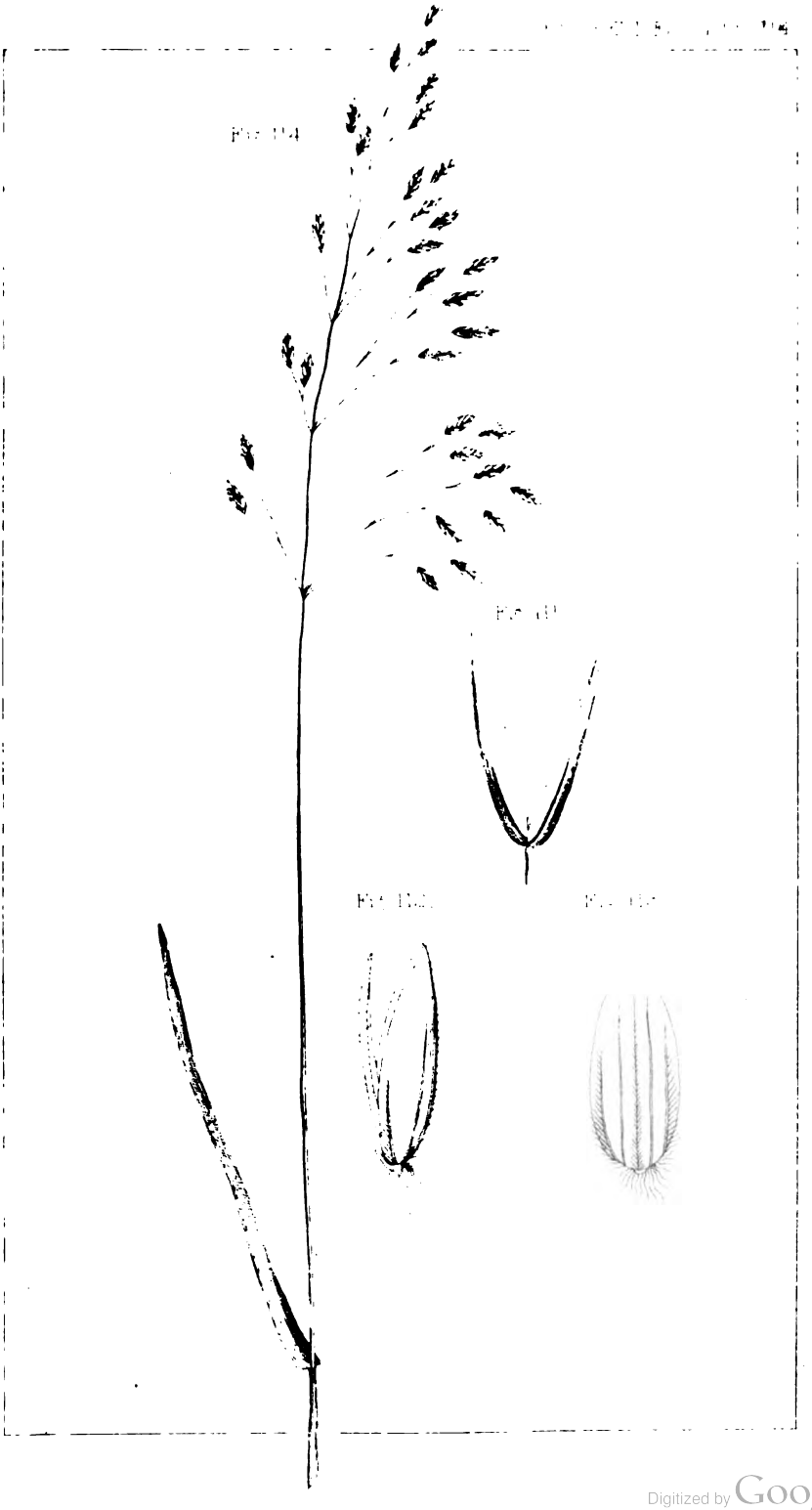

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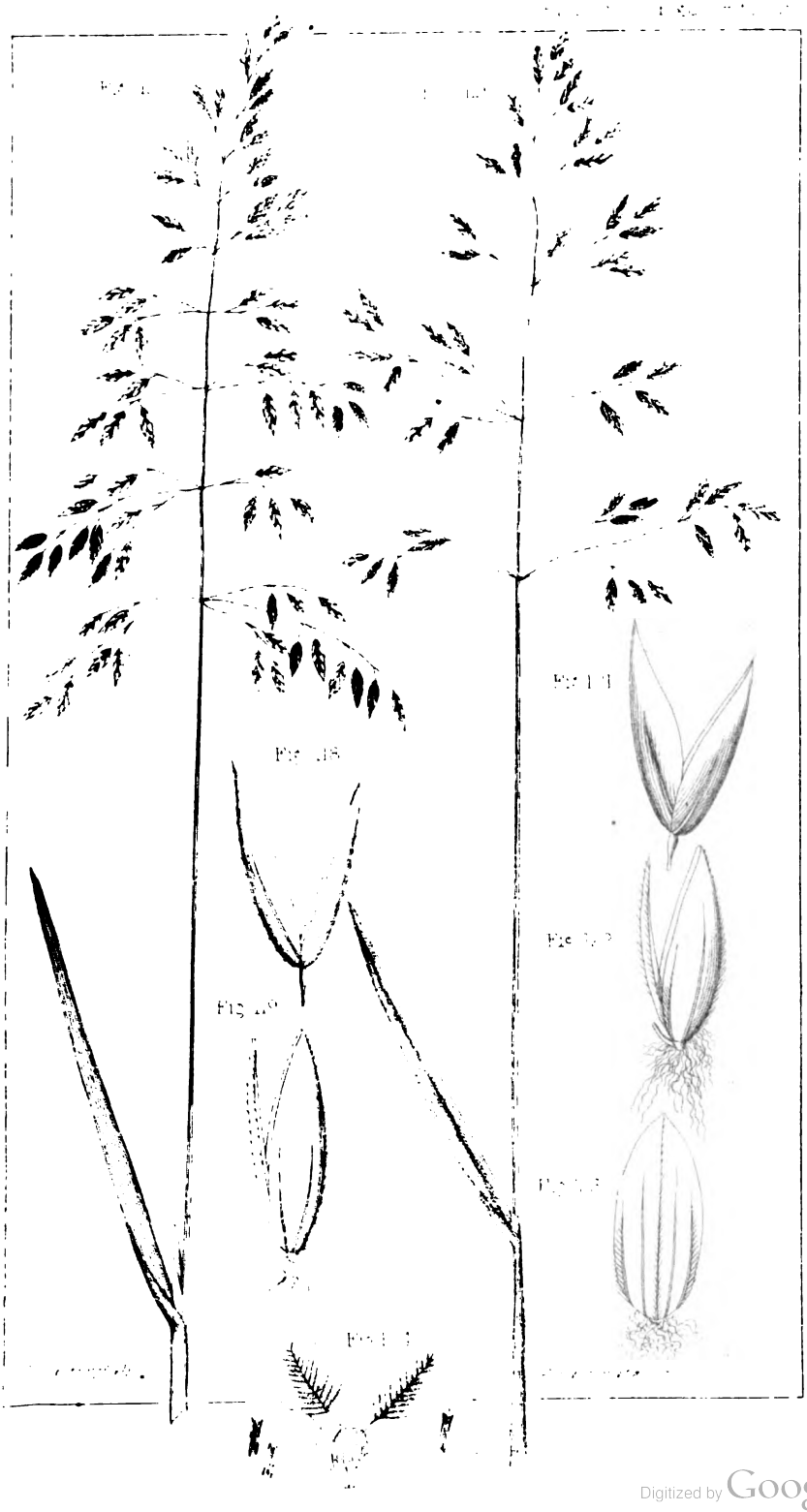

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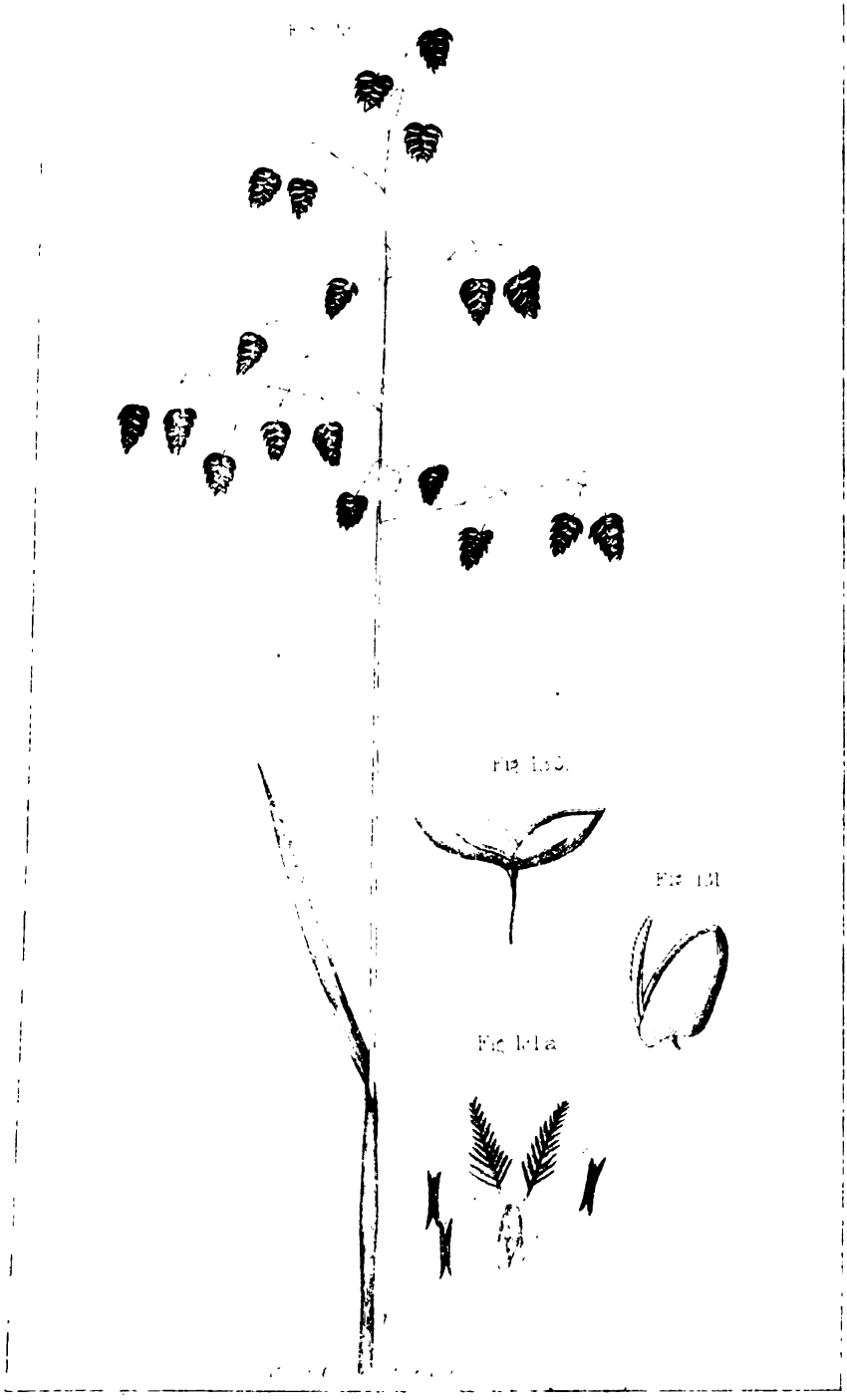

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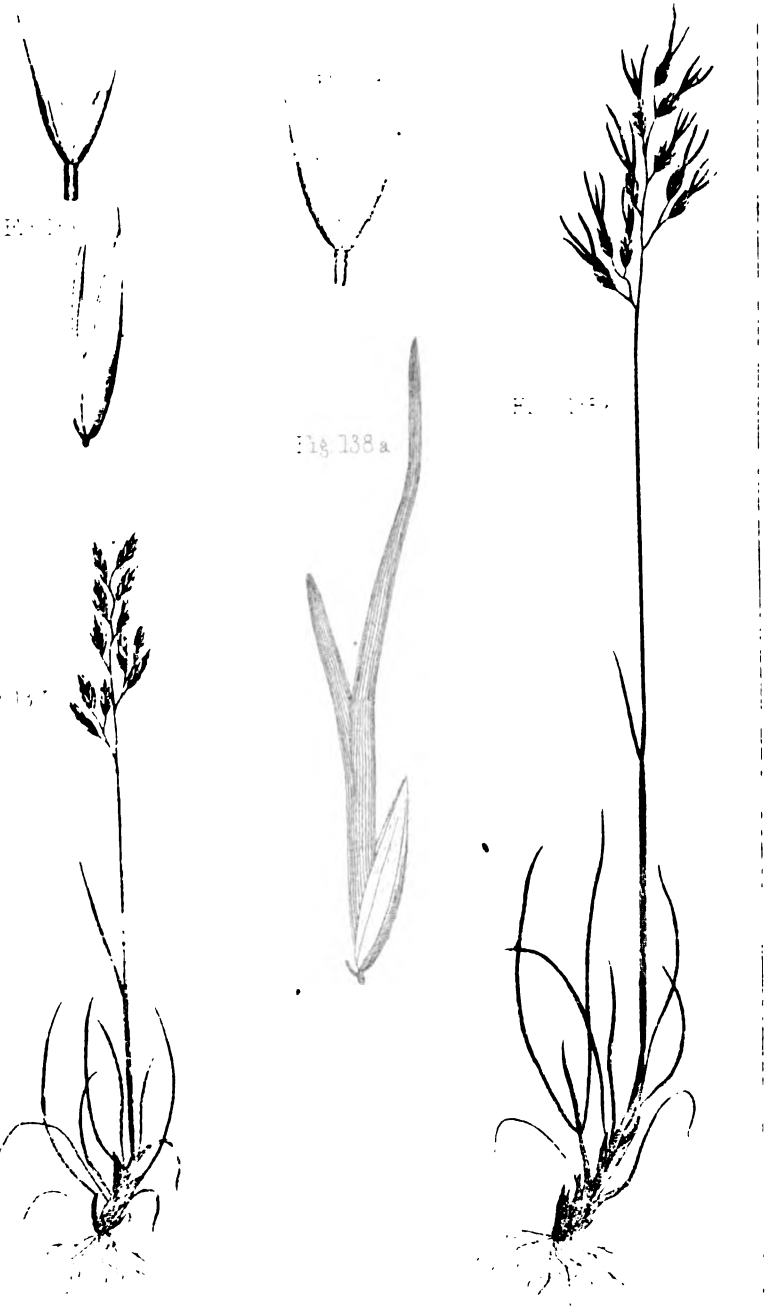

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Fig. 144. a

Fig. 144. b

Fig. 144. c

Fig. 144. d

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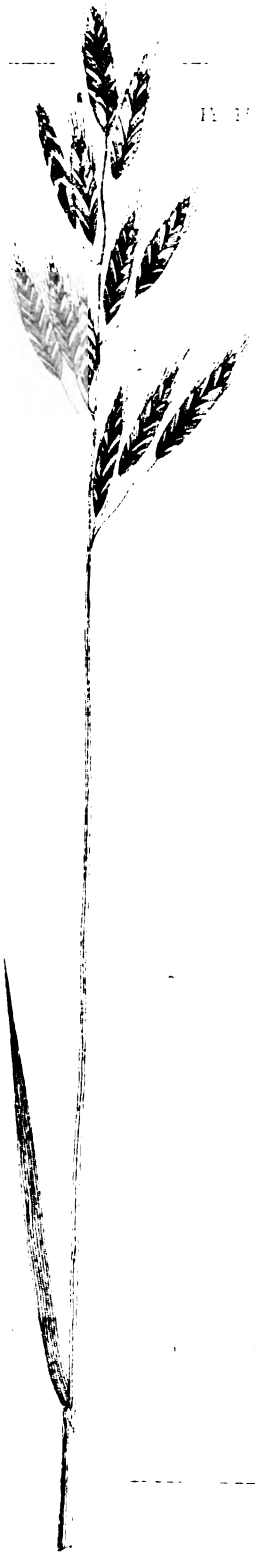

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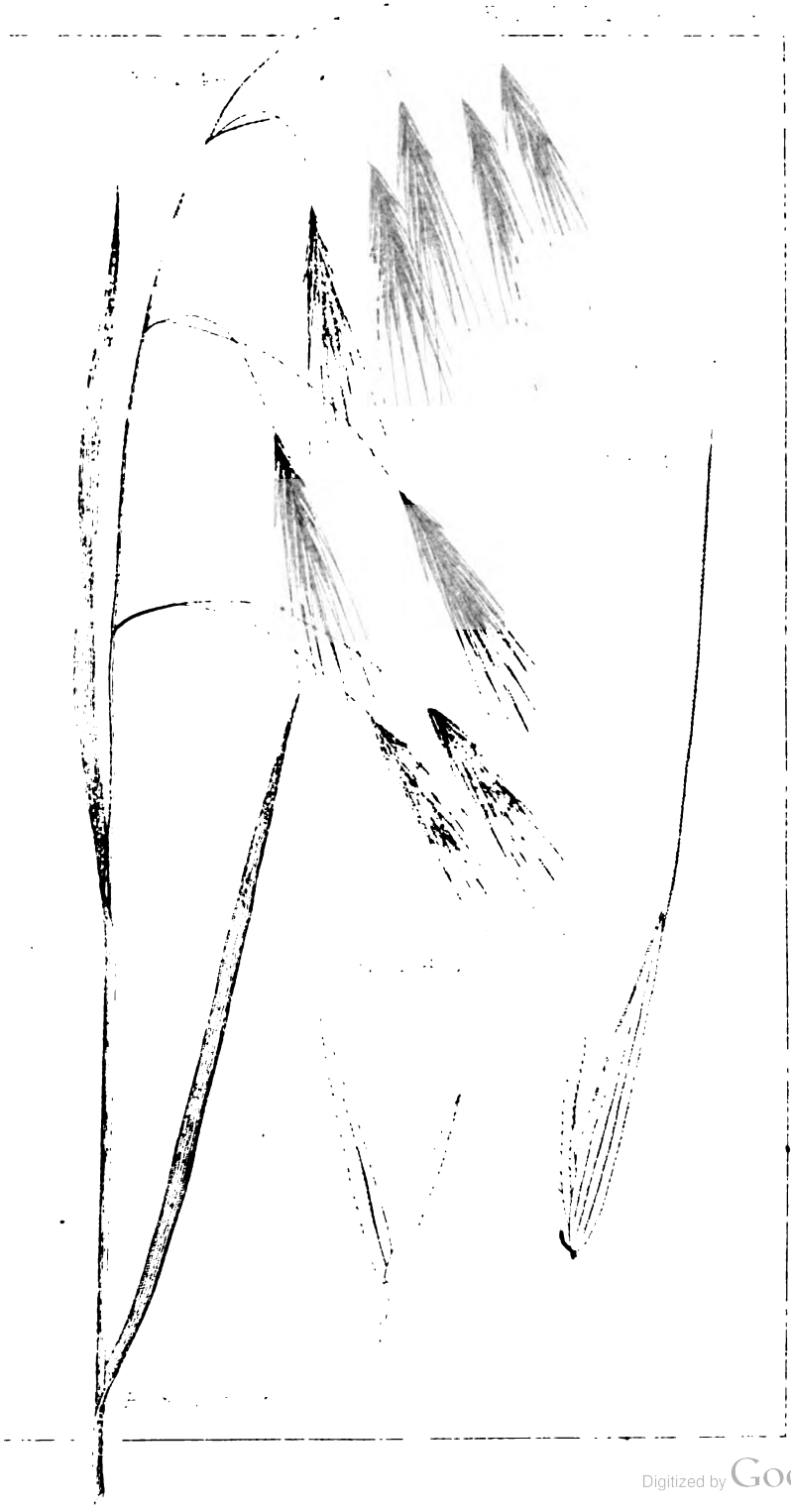

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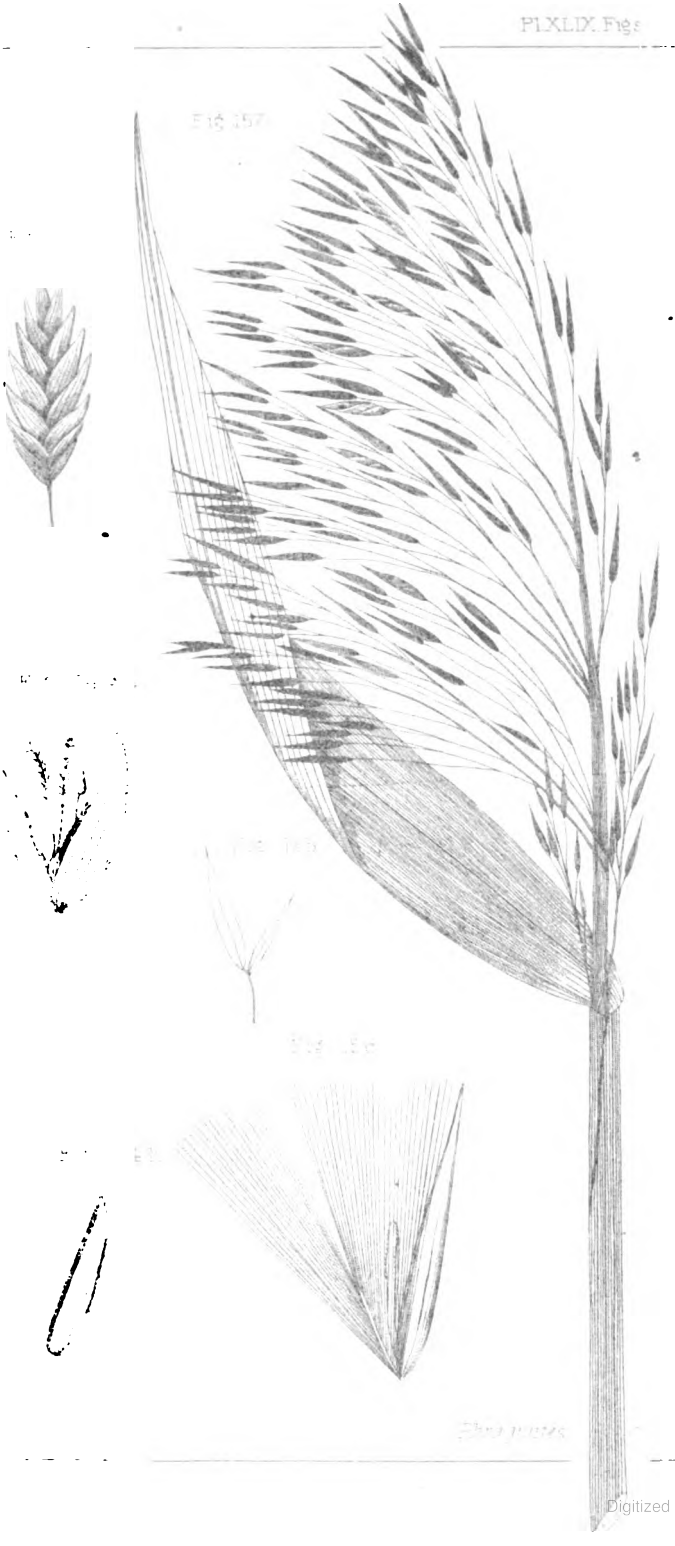

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Lolium temulentum

Triticum repens

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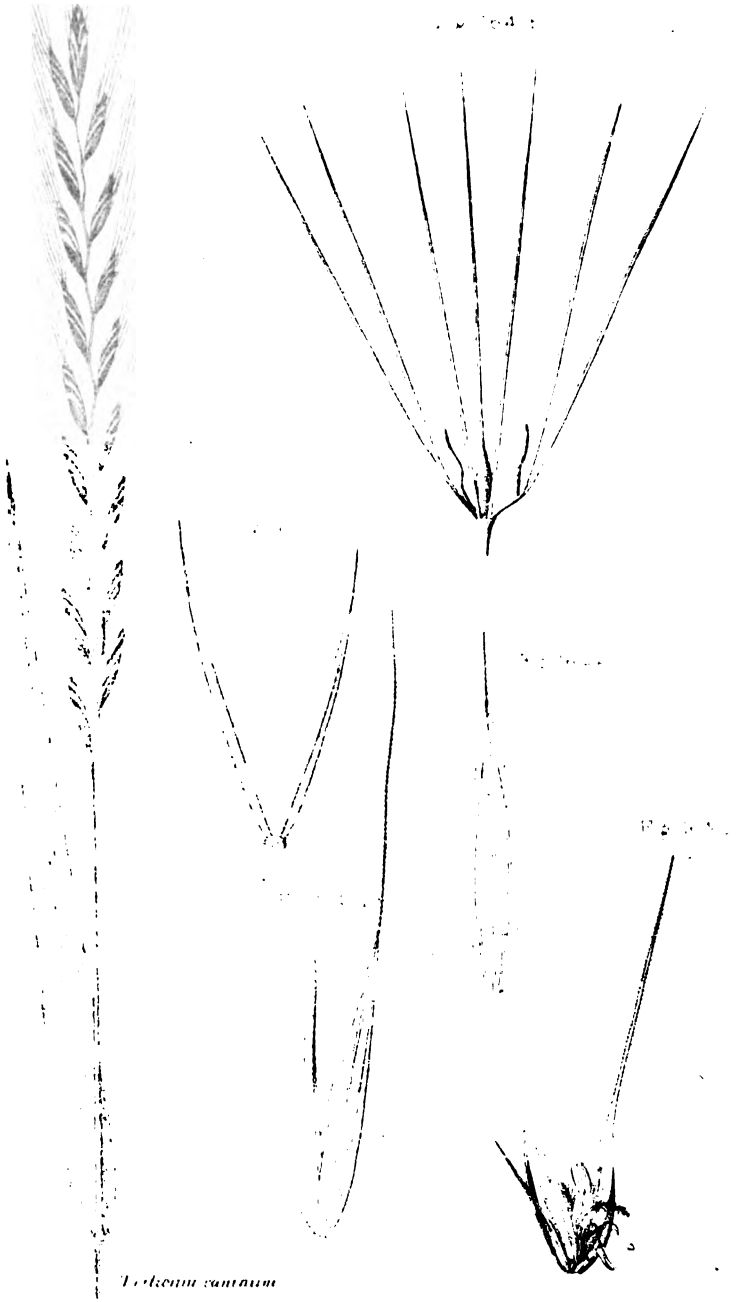

Lolium cantium

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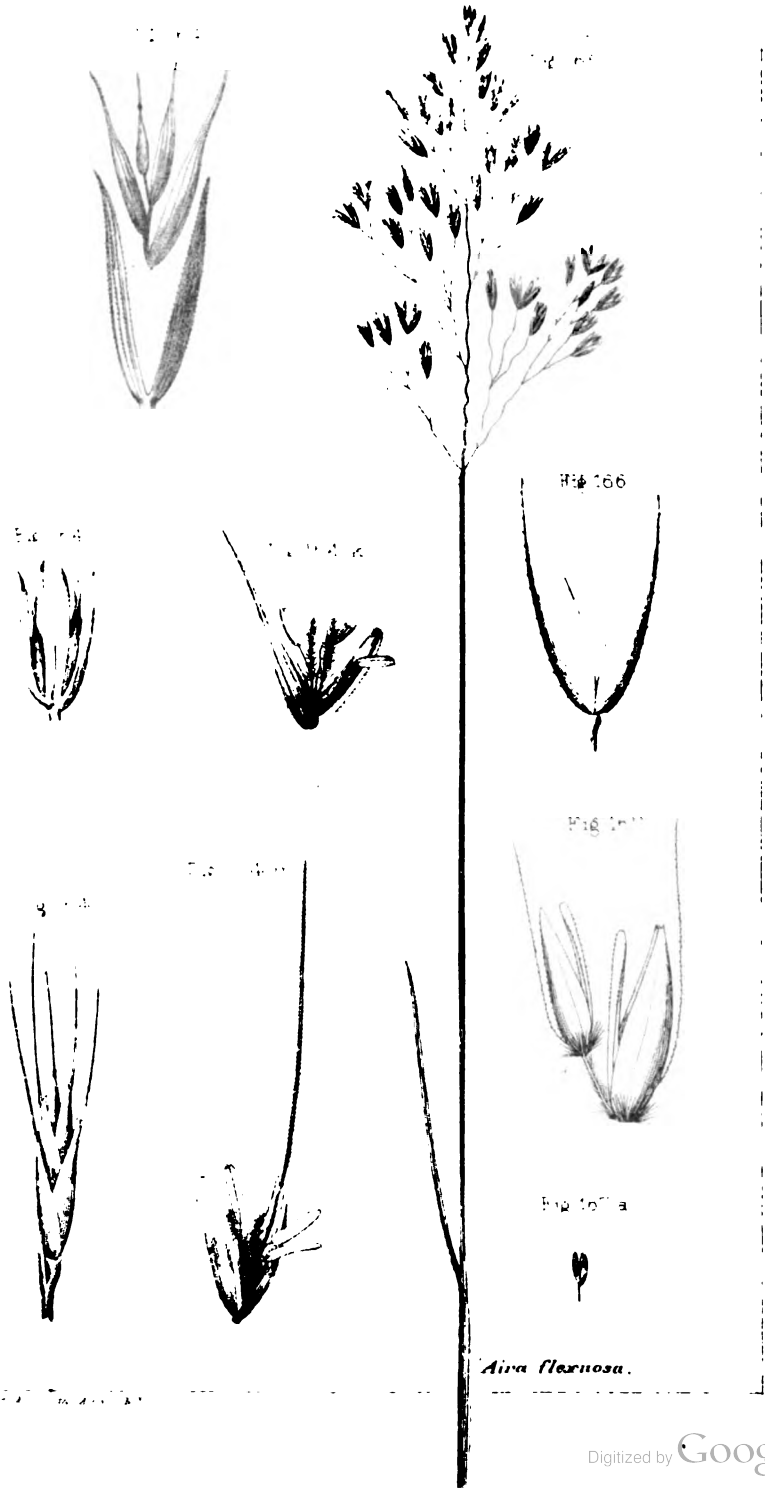

Aira flexuosa.

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Aira *caespitosa*

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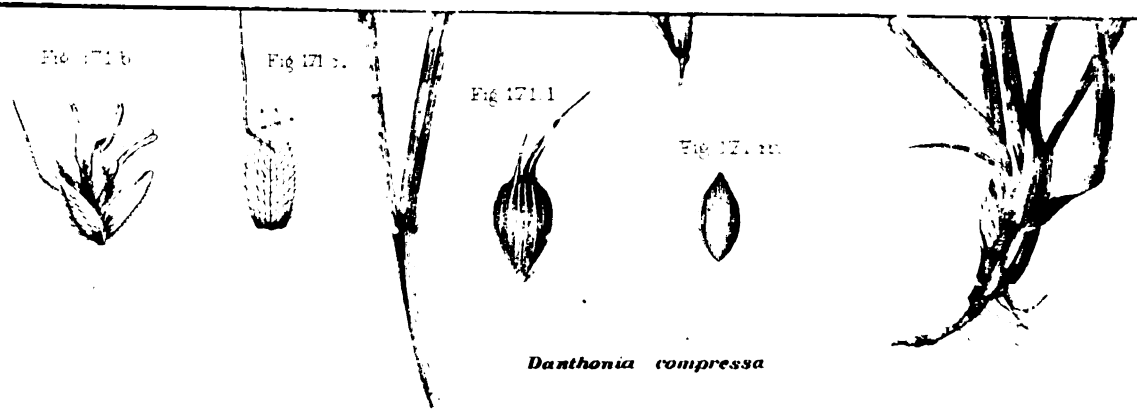

Fig 171 b

Fig 171 c.

Fig 171 d

Fig 171 e

Danthonia compressa

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Aira *cæspitosa*

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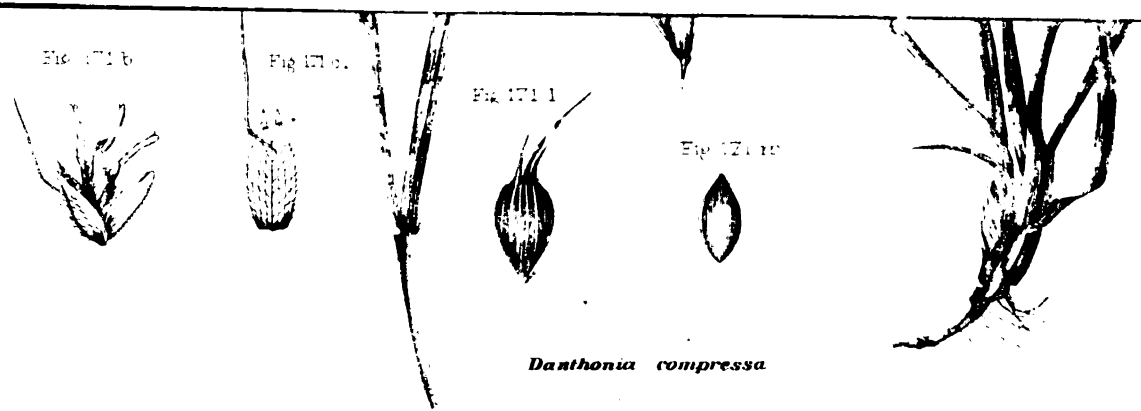

Fig. 171 b

Fig. 171 c.

Fig. 171 d

Fig. 171 e

Danthonia compressa

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Pl. L. Figs. 174, 174 a, 174 b.

Fig. 174

Fig. 174 a

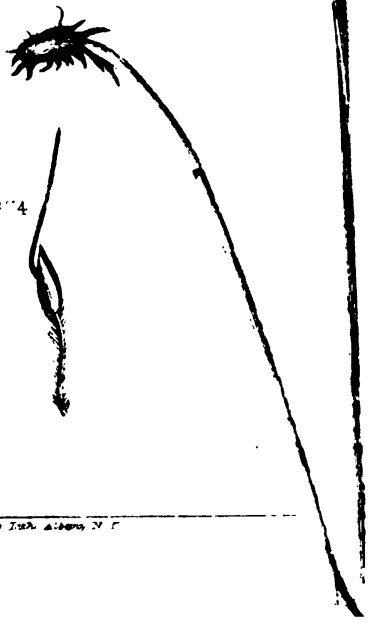

Fig. 174

Fig. 174 b

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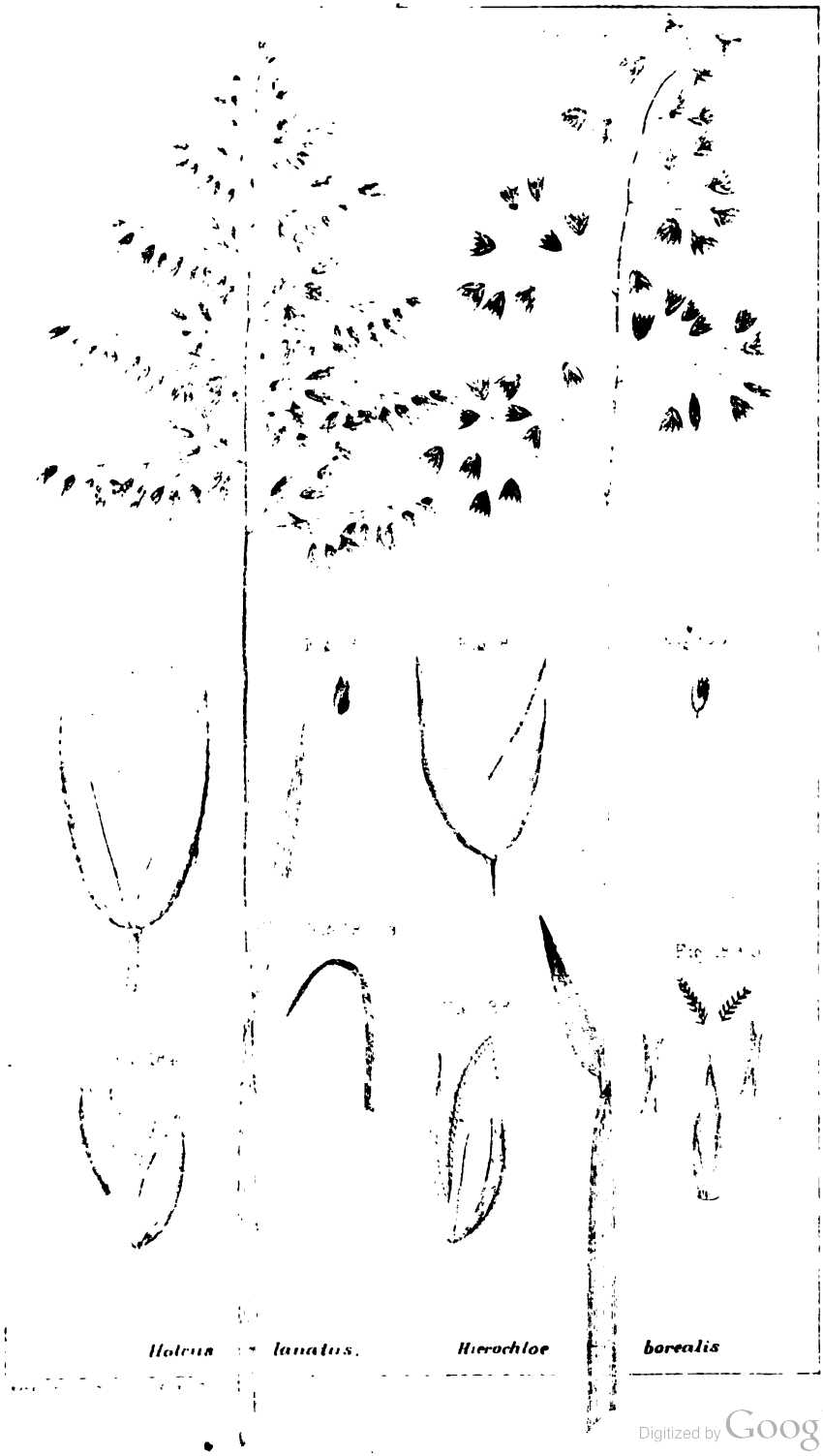

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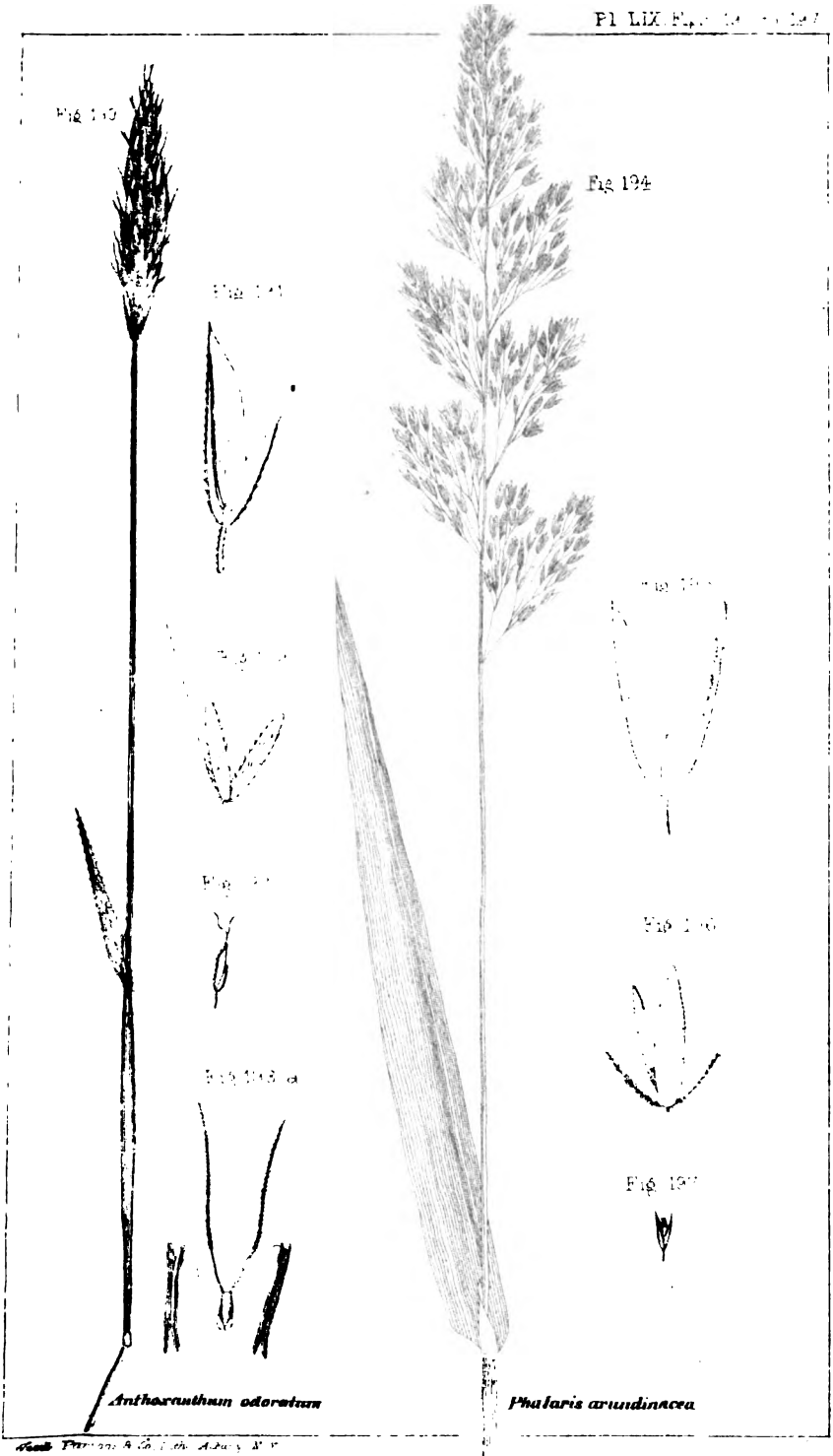

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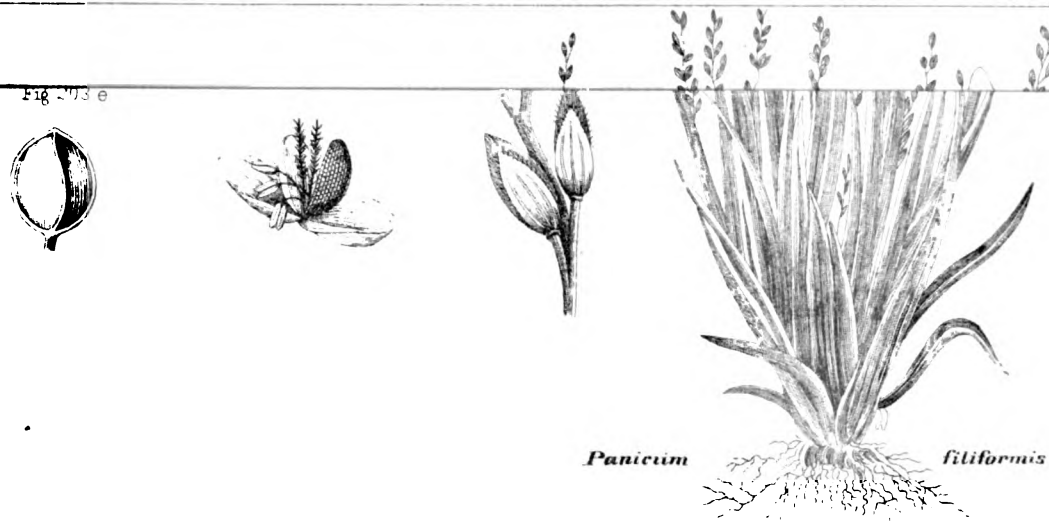

Fig 296

Panicum *filiformis*

Wood, Parsons & Co. Lith. Albany N. Y.

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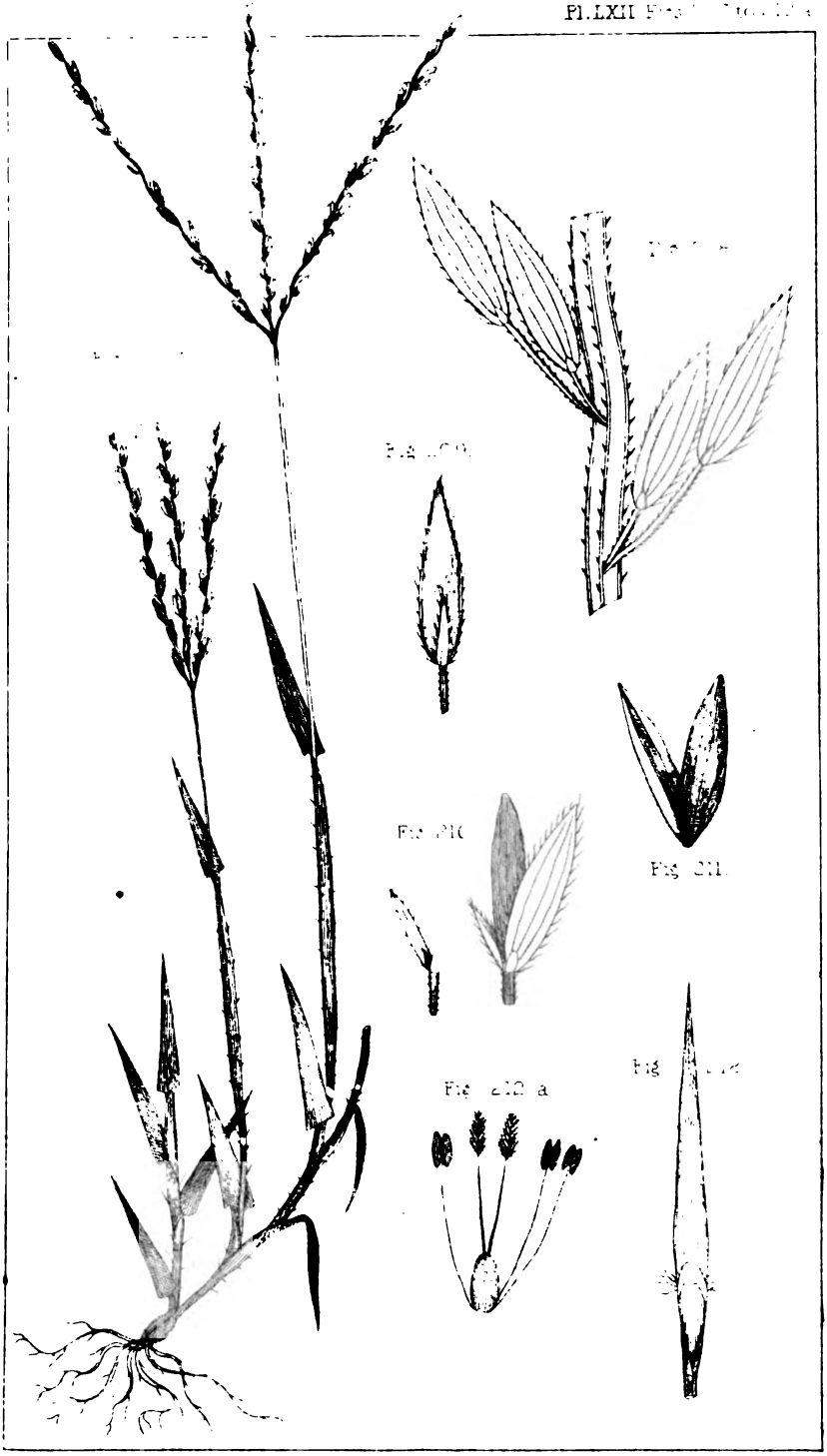

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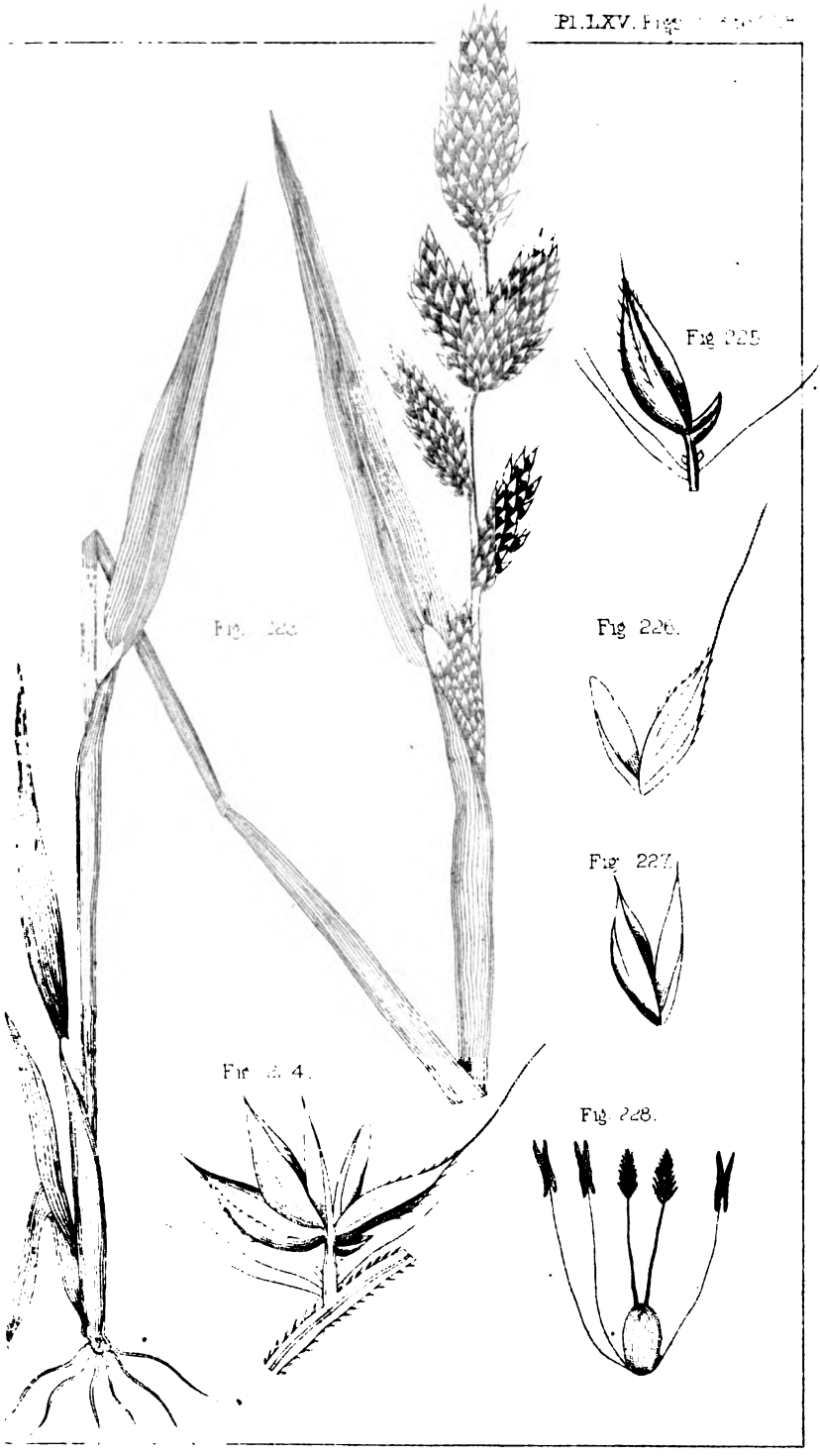

Fig. 225.

Fig. 226.

Fig. 227.

Fig. 228.

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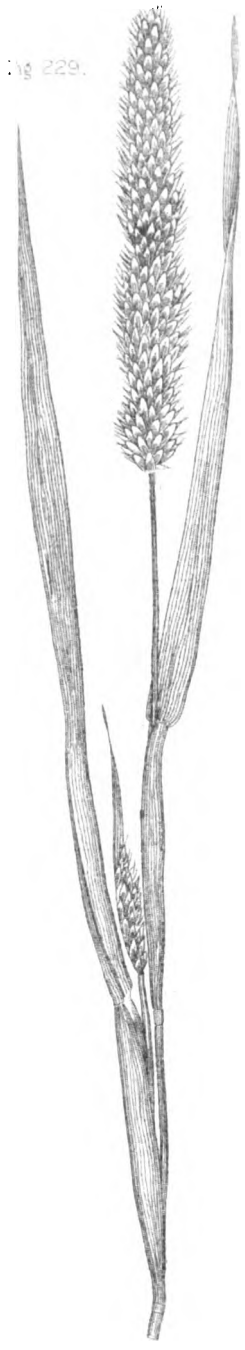

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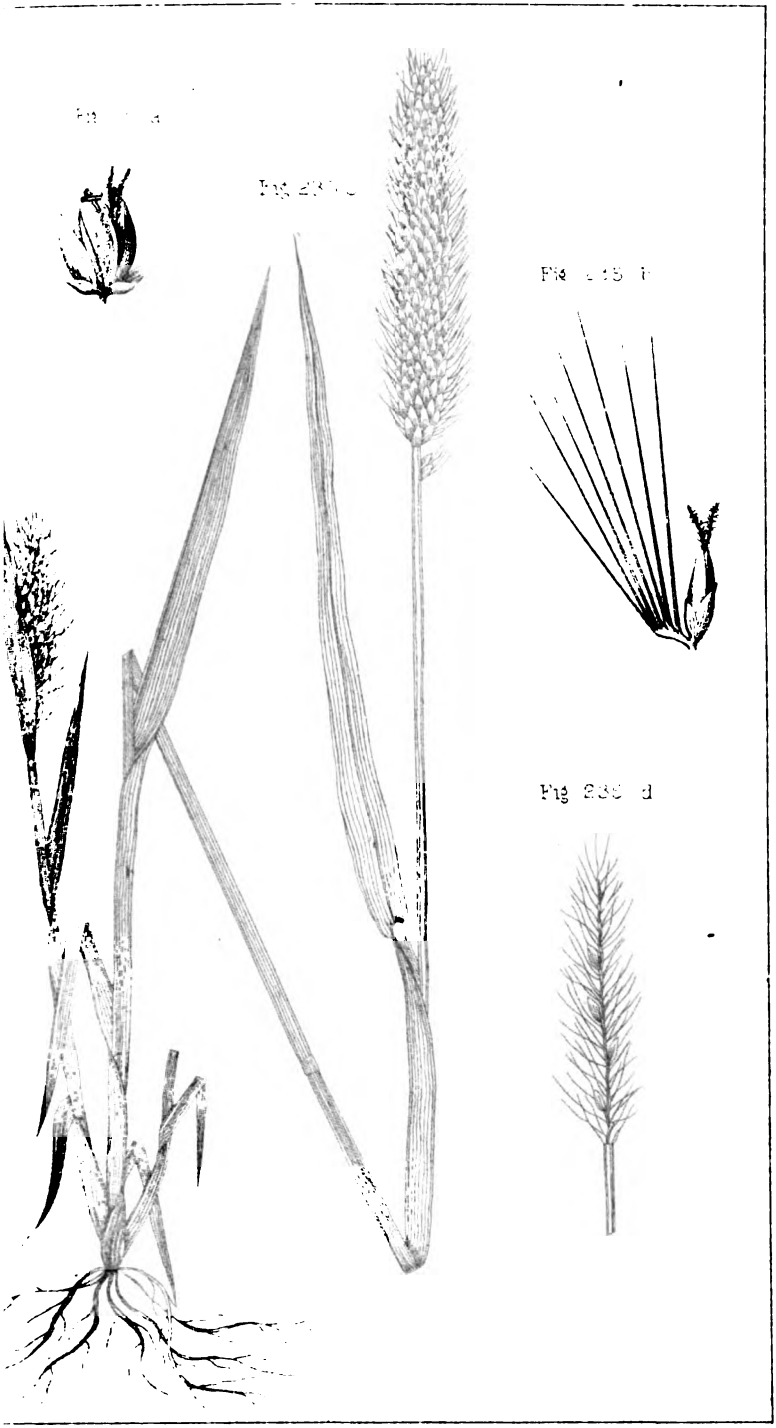

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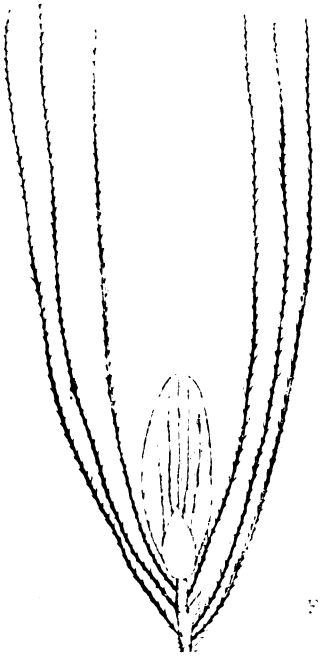

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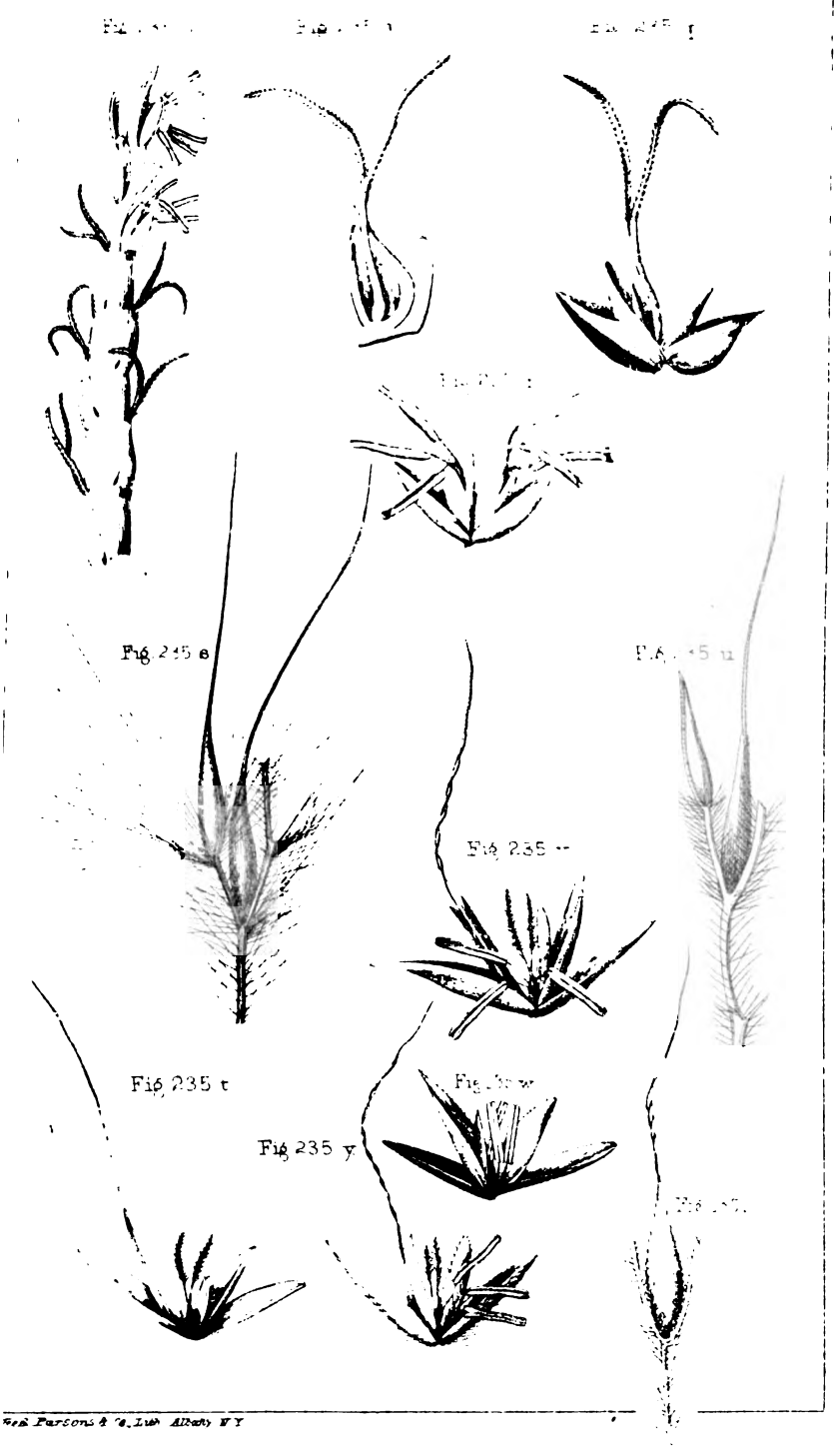

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Fig 238

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FIG. 41.

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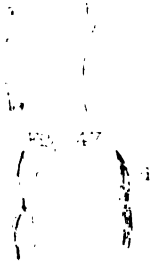

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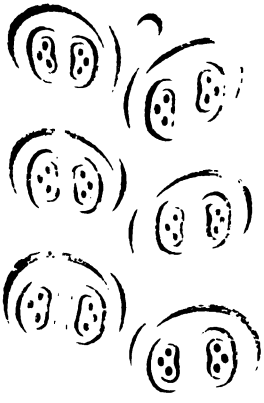
FIG. IV.

FIG. V.



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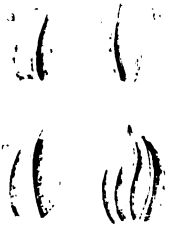

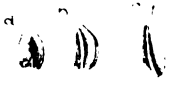

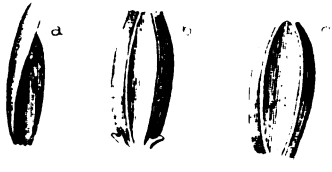

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ON PLEURO-PNEUMONIA.*

By George Armatage, M. R. C. V. S., Leighton Buzzard.

Different forms of the Affection.—The disease commonly known as pleuro-pneumonia, derives its name from the circumstance that, under its effects, the serous membrane (the *pleura*) which covers the lungs, and lines also the chest, as well as the substance of the lungs themselves, are simultaneously inflamed. Briefly, the term implies inflammation of the pleura and lungs, the former being termed *pleurisy* or *pleuritis*, and the latter *pneumonia*. Hence the compound appellation, *pleuro-pneumonia*.

Since greater attention has been paid to the cultivation of veterinary science, stimulated by the increasing value of our agricultural stock; since our communications with the continent have opened out channels for the introduction of foreign cattle, *and with them pleuro-pneumonia*, two distinct forms of the affection have been recognized.

The first is the ordinary form of pneumonia, with pleuritic complication, attacking man and various animals, *not usually fatal*, sudden in its attack, acute throughout its stages, and terminating favorably, in most instances, within ten days or a fortnight. It owes its origin to peculiar conditions of the atmosphere, temperature, season, altitude, exposure, etc.; seldom spreads beyond the animal affected, and is markedly amenable to medical treatment. From these peculiarities, this form is recognized as *sporadic* or *indigenous pleuro-pneumonia*.

In the second variety, although the same structures are involved, the nature of the affection is strangely different. It is known among scientific men as *epizoötic pleuro-pneumonia*, in contradistinction to the first. Although not distinctly specified, there can be no doubt the conditions upon which this report is required to be written clearly point to the epizoötic form of the affection, a consideration of which, therefore, will be proceeded with in the following pages.

* From the Transactions of the Highland and Agricultural Society of Scotland.

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Epizoötic Pleuro-pneumonia.—Synonyms.—Various terms have been applied to this malady. In certain localities of Great Britain it is known as the lung plague, lung complaint, lung disease, new disease (in contradistinction to aphtha, or foot-and-mouth disease), epidemic, or demic, etc. Dr. E. Headlam Greenhow* has given to it the name of "pulmonary murrain."

Among the Germans, it is known as "lung-enseuche," "peri-pneumonia," and "exudativa contagiosa." Delafond, a celebrated French writer, terms it "*maladie de poitrine du gros bétail*," and adds, "*connue sous le nom péri-pneumonie contagieuse.*" The Italians term it, "polmonea dei bovini."

History.—At the period when Youatt and Blaine compiled their treatises, little or nothing was known in Britain regarding the form of pleuro-pneumonia we are now considering. On the continent, however, matters wore a different aspect. From the continual commotion and disturbed states of the various countries, due to rebellion and wars, the movement of large numbers of animals became necessary. They were required both as animal food and beasts of burden, and their removal from native soil insured also the transmission of indigenous diseases.

The course of transit lay from east to west, in the direction of the greatest centers of population; and to supply the demand arising there, dealers and others penetrated the thinly inhabited districts of Europe, steppes of Asia, and even Africa, where large tracts of land afforded a subsistence to peasants by breeding cattle and sheep.

At length, the blessings of peace returned, and the people of northern Europe turned their attention to industry, and cattle were as abundantly required to consume the refuse of distilleries, together with starch and sugar manufactories which had been established, especially in Holland and Germany. In this way, also, diseases were transmitted with as much certainty, and even greater constancy, as during the turbulent times; and these countries became at once stations for the disease. The introduction of fresh virus was unremitting, and contagion regularly and certainly distributed when the animals were again removed.

These things have continued up to the present day, having also increased rapidly in consequence of the trade which occasioned the demand for cattle being considerably augmented. Within a few hours of our east coast ports, are some of the greatest stations for pleuro-pneumonia epizoötica which constantly menace our island,

* Report on Murrain in Horned Cattle, 1857.

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and render traffic in animals a dangerous trade. In Ireland, too, it prevails largely, as every-day evidences too plainly tell.

The early accounts we have of the existence of epizoötic pleuro-pneumonia on the continent do not date so far back as might be anticipated. This is very obvious. In the neglected condition of the various countries, brought about by wars and tumults, the inhabitants of which were more given to rebellion and predatory pursuits than to culture of the land, veterinary science was almost undiscovered. The care of the domestic animals was in the hands of sorcerers, grooms, shepherds and empirics, *et hoc genus omne.* Diseases were not recognized as differimg from each other. Observation had not commenced in a manner calculated to be of service to futurity. However, in the repeated opportunities which were afforded by the decline of wars and advent of peace, the realities of a disastrous condition among the cattle presented themselves in too stern a manner to be overlooked. Earnest men carefully weighed the great question, and eagerly directed their efforts toward providing a remedy for a glaring public evil.

The value of the stock, the illiterate men who presumed to minister to the ailments of animal life, and the enormous losses, to which additional and as enormous and even useless expenses were added, became subjects which called for immediate radical reform. Veterinary colleges were established in nearly all the principal cities. Eminent men were selected as teachers, and employed in various commissions, from time to time, to investigate the outbreaks of disease, with a view to suppression, etc. Government and aristocracy patronized the growing science as the future conservator of their wealth. Then valuable researches, experiments and observations were instituted, the records of which, at this day, form the great guides to the truth of all that we, in Great Britain, are acquainted with.

Prior to this, from all known time, it has been remarked, diseases were not recognized as possessing different characters. It is therefore almost impossible, in many instances, to gather from the meagre reports which are accessible, how far pleuro-pneumonia epizoötica can be definitely traced. Having a similar home to the steppe disease, or rinderpest and vesicular aphtha, it is only reasonable to suppose they have, *pari passu,* moved into and invaded fresh countries entirely in consonance with the demand for cattle and trade regularly carried on. When, however, a scientific system of observation commenced, these diseases were separated and distinguished by the special char-

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acters which were found to obtain in each. From this time we can distinctly trace pleuro-pneumonia. There are records which are understood to refer to it as far back as 1693, others in 1713 and following years, which are more reliable.

In 1745 it visited Britain, and the accounts given by Drs. Layard, Hird, and Brocklesby, with Youatt, the never-to-be-forgotten veterinarian, evidently include with it *rinderpest*, which it is known prevailed at the same time. To this may be ascribed the enormous losses that took place, 200,000 being reported to have died in Holland, and 40,000 in Nottinghamshire in 1747. During six months, Cheshire alone lost 30,000, and in all more than *three millions* of cattle, in spite of all measures which were advocated by the most eminent men. It is not only remarkable, but an incident in the annals of history that veterinarians have to deplore, while the interest in the value and preservation of the stock was aroused by the ravages of widely spreading and extremely fatal diseases; while the desire to withstand them thoroughly was rapidly increasing and paving the way toward establishing scientific means to arrest their onward progress, and confine their destructive effects to a smaller area, the avalanche rushed down upon the but half complete edifice, and disclosed how unable, at that stage, it was to cope with such an overwhelming force. Veterinary science had but just dawned in Britain. Enterprising men, who had witnessed the fearful consequences existing upon the continent, where the flocks and herds are infinitely greater than here, had proclaimed, at considerable personal trouble and expense, the necessity for a properly scientific training of veterinary surgeons in Britain. The plan was favorably received and ultimately adopted, but, before the army was duly equipped, the strange foe made its appearance, and, as in the cattle plague of 1865, exposed the helplessness of medicine in epizoötic diseases.

In both cases, with few exceptions, men knew not the signs of the maladies. Why should they? Where could they have seen them upon their own soil, when no man living had witnessed them? Where could they turn for records unmixed with extraneous matter, and untainted by faulty detail and even positive error? Veterinary surgeons, as a rule, were not given to wander far from home, and their means did not usually allow of a visit to Holland, Prussia, or the regions of the Danube, where they might spend months in order to investigate diseases which, in all probability, would not visit the land, at least during their lifetime. Besides, the time had not arrived in this country when it was decided that a veterinary surgeon should

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necessarily have an idea of other languages besides his own, consequently few only who possessed this privilege and the opportunity for inquiry, were aware of the existence of such diseases, and the lights in the profession appeared like dim specks throughout a dark city, solitary, insignificant, unheeded, and almost despised.

The time, however, is advancing when it will be possible for veterinary science to render more powerful aid. Taken as a handmaid to agriculture, and its importance demonstrated to the tillers of the soil, it will become, as upon the continent, an institution in which the interest and security of the wealth of the country is permanently invested.

For a considerable time pleuro-pneumonia epizoötica was not witnessed in Britain. From causes not well explained, and therefore not well observed, it appeared simultaneously in England and Ireland about the year 1840. Later accounts are given, in which it is stated that in 1842 it was brought from Holland. Doubtless in 1840 it may have been confounded with the sporadic form, as many statements and facts go to prove. When in Ireland recently, the writer met with several gentlemen who spoke seriously of having seen *the* pleuro-pneumonia, and even suffered from it among their own stock, long before 1840. There can be no surprise about this, when it is understood that symptoms and *post-mortem* appearances of both forms of the disease so greatly resemble each other. It is only by careful comparison of existing states, duration of the disease, absence or presence of the evidences of contagion, and other points which claim the consideration of scientific investigators, that the true nature can be clearly made out. Such is a mistake into which even veterinarians themselves may fall who are not thoroughly conversant with the habits of cattle and the courses through which the two diseases may run. From that deficiency it has been known that practitioners, young in the service, have declaimed against the contagious nature of pleuro-pneumonia epizoötica, and made statements of successful cures, all of which were probably true, but only applied to sporadic pleuro-pneumonia.

The reader will clearly perceive by this how necessary it becomes, when speaking of disease of the respiratory organs in cattle, to admit the existence of the two forms. One curable, and not usually fatal; the other highly contagious, *not amenable to medical treatment, and decidedly fatal in the widest sense.* For this reason, the affection will be exclusively considered throughout this paper as *pleuro-pneumonia epizoötica.*

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Prevalence of the disease since 1840.—From an ignorance of the nature of epizoötic diseases, many authorities were inclined to regard *pleuro-pneumonia*, as now seen, as merely an extension of the sporadic form with which they were already acquainted.* The contagiousness was imperfectly made out, and frequently denied, and circumstances favorable toward establishing proof were commonly overlooked. Dairymen, together with farmers who dealt largely in cattle, were the greatest sufferers. While the questions of contagion and spontaneous origin were variously discussed, all kinds of treatment were persevered in, and alike ended in negative results. In some cases twenty to seventy-five per cent of the whole number have been carried off; while in others animals slowly recovered, and owners have expressed themselves far better satisfied when death has at once carried off its victims; as otherwise they often only remain a perfect skeleton, and exhibit the greatest difficulty to improve in condition.

Many persons also argued that the disease would die out in a year or two, basing their assurances upon the observed fact in other complaints, viz., the tendency to become milder after a time. The history, however, of pleuro-pneumonia epizoötica, as it has pursued its ravages since 1842, tells a different story. The constant accession of fresh virus, which was not taken into account by the promulgators of the hope, has insured the equally fatal character of the scourge from its first entrance up to the present moment. In the city of Glasgow, according to published reports, during seventeen years, 3,759 cows died from pleuro-pneumonia epizoötica, and 1,594 were also slaughtered in consequence. The value of these is estimated at £54,677; but the statements by no means represent the exact loss, many dairymen refusing to give any particulars. In some individual cases the losses were very large, one person asserting he had lost animals for years at the rate of £300 annually.

This is exactly what takes place in other towns where cows are purchased indiscriminately for dairy purposes. Edinburgh, Dublin, Leeds, Manchester, Liverpool, etc., form good examples. In London, where such immense numbers of animals are kept, the prevalence of pleuro-pneumonia epizoötica has caused many men to relinquish the milk trade altogether. One dairyman at Brixton recently stated, in presence of the writer, that it required that he should lay out a thousand pounds every year to replace stock which became affected. As soon as the symptoms of indisposition occurred, and milk the least suppressed, the animals were sent off at once to the butcher; and

* Youatt, to wit.

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although he could not say he had lost many, yet he was constantly a considerable loser in consequence of the frequent and necessary removals.

If we take these as examples of what undoubtedly occurs over the country at large, the annual sum of mischief by pleuro-pneumonia epizoötica must be something astounding. Statistics are not wanting which profess to show what that sum really is. They have been stoutly denied to be correct, but those who have looked carefully into the matter are now no longer in doubt, and prepared for reform in cattle-traffic matters, but would prefer it to be done as silently as possible, and without any exposure of the arithmetic of the system which now calls so loudly for amelioration.

Causes.—As in all epizoötic affections among cattle, we trace the origin of *pleuro-pneumonia epizoötica* to contagion propagated by the continued and indiscriminate movement of animals to and from fairs, markets, etc. This will become more apparent when we take up a consideration of the nature of the disease. The mystery of the origin of the first case proves as great and insurmountable here as in the allied diseases of man, yellow fever, cholera, typhus, etc.; and among animals, rinderpest, small-pox and hydrophobia. That there are centers of origin we have no doubt. As man falls a victim to cholera in the Pontine marshes, or yellow fever at New Orleans, as soon as he arrives; in like manner, healthy cattle, taken from places perfectly free from diseases, would become a prey to the indigenous epizoötics which prevail in the steppes of eastern Europe and borders of Asia, etc., and mortality proportionately excessive, if they were collected and imported from those countries. We, as well as cattle, suffer to an aggravated extent, because infected subjects are allowed to go about indiscriminately, and scatter the poison from their bodies wherever they go.

That the prevalence of pleuro-pneumonia is alone due to contagion is satisfactorily proved by several circumstances. *First.* Admitting for a moment, that all contagious diseases arise spontaneously where filth abounds, and neglect of sanitary laws exists *ad libitum*, how does it happen that during a whole century this affection was not seen, and particularly as cleanliness and ventilation were not so much regarded as now? *Second.* How does it also happen that pleuro-pneumonia epizoötica has never been witnessed in certain isolated districts, where cattle are not taken from other parts, but bred upon the spot; yet filth and neglect of sanitary regulations is as certain in many of them as the buildings upon the farms? *Third.* Why are

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the dairymen and others, who frequently resort to fairs and markets for replenishing their stock, always the greatest sufferers, even where every caution is exercised and attention paid to sanitary regulations?

The answers are simple and irrefragible. Although filth is an acknowledged cause of disease in man and animals, its baneful effects are manifest differently upon each, in accordance with climate, latitude and other conditions. These peculiarities constitute different tracts of country as the homes of certain maladies, and, in addition, we need other conditions, but which are not well understood, to generate epizoötic or contagious diseases. Beyond such localities they can never arise spontaneously. Although in our own country filth may abound, we never hear of its generating the yellow fever of New Orleans; and wherever we find pleuro-pneumonia epizoötica, rinderpest, small-pox or hydrophobia, there we may, without doubt, trace its origin to the effects of contagion only. If the causes of rinderpest or pleuro-pneumonia and aphtha were in reality present within the limits of our kingdom, surely the experiences of our unusually dry and hot summers, with deficient water, and stagnant pools, and accumulations of filth and putrescence beneath our very noses, would have developed them in accordance; and likewise the severe winters, so destructive to the progress of putrefaction, would have caused them to disappear in proportion. But such has not been our experience. These affections are not influenced by heat, drought, or cold: they maintain a steady, certain and uncontrollably destructive influence under *all* conditions of temperature, and appear to be aggravated only by fresh introduction of virus among sound, healthy stock.

When dairymen have been asked, "How did you contract the disease?" they have replied, "By purchasing cattle in the markets." Some have, in consequence, avoided the market altogether, and purchased only from the breeder of the animals. In such instances, disease has not appeared before inspection for slaughter by fleshers, or when other cattle have been driven in the vicinity. Careful examination seldom fails to disclose that contagion has been at work. One case, out of many which have come within the notice of the writer, will render this more clear. A number of cows had been turned out to graze in a pasture adjoining a dairy on the outskirts of the town, and at some distance from any thoroughfare; cattle from the market were driven along the high road, and, becoming unmanageable, ran along the private road to the dairy. Seeing the cows in the field, the market cattle burst the fence and freely mixed with them; considerable time, therefore, elapsed before the lots could again

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be separated. From that time *pleuro-pneumonia epizoötica* gained an entrance to the stock, and compelled the owner to clear out the whole.

Nature and definition.—One of the means by which the practitioner in veterinary medicine determines the nature of a disease which he is called upon to investigate, lies in his estimate of the causes that are known to generate it. In the case of pleuro-pneumonia epizoötica, its prevalence, taken in conjunction with other features to be noticed, at once incontrovertibly stamps it as a highly contagious malady.

From the lengthened period which elapses between the occasion of known contact with diseased animals and appearance of the first symptoms, together with the lingering or tardy progress of diseased action, it is known as *subtle* and *insidious*. Whatever may be the fatal and deceitful nature of the plague (rinderpest), pleuro-pneumonia epizoötica possesses those powers in a thousandfold more fatal degree. The seeds of contagion lurk among the stock for weeks, or even months, and eventually break out in isolated and often not well-marked symptoms, and with the death of the first victim proprietors are sometimes induced to consider that the disease has altogether departed again. However, after a few more weeks, another victim falls, and, in the lapse of time of more or less duration, another, and another, and so on until all are taken.

It may be, also, that the owner, ignorant of what he has to contend with, purchases new stock, one by one of which goes in the same manner, and nought but absolute ruin stares him in the face. The insidious nature of the affection was the cause of its introduction to Australia and America, and has alike in many cases caused its extensive propagation in our own country long before proprietors were acquainted with its presence. Briefly, then, we define epizoötic pleuro-pneumonia as an acute inflammation of the respiratory organs contained within the chest, accompanied by the development of a specific blood poison, by which, as an infectious or contagious element, it is peculiarly and characteristically propagated among animals of the same species. Another feature consists in its being peculiar to the cattle tribe; for, as far as we know, the same affection has not been proved to attack other animals. It is an affection which appears but *once* in the lifetime of the individual, and those attacked but slightly are therefore viewed after recovery as enjoying perfect immunity among those suffering from it.

Symptoms.—As in all contagious affections, a period of incubation

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takes place. This is simply the time, as already alluded to, that elapses between known contact with diseased animals and appearance of the signs which mark the disease. It has been stated by some that the symptoms may appear in a fortnight. They, however, more generally occur about six weeks or forty days. In some instances a further delay takes place, as the transmission to Australia, occupying a voyage of three months, would appear to bear out.

During the period of incubation the animal is said to be *infected*. The condition frequently improves, and the yield of milk likewise increases; facts which may not be inaptly attributed to the primary effects of the poison upon the nervous system. The first symptoms are usually obscure and unnoticed, except by professional or practiced eyes. These are slightly disturbed states of the respiratory and circulatory organs, accompanied by slight shivering fits and elevation of the temperature of the body, as indicated by Cassella's registering thermometer. Occasionally a cough is heard, which is not, however, sufficient to cause alarm, unless there be, in addition, loss of appetite, hot mouth, dry muzzle, and decrease of milk.

The milder signs continue for several days, when the bowels become costive, cough more troublesome and persistent, with staring coat and intervening shivers. The pulse is tolerably full and rapid, numbering 80 or 100 beats, but shortly becomes smaller and not so distinct. The respiration is accelerated; and, to facilitate this, as the disease advances, the nose is extended and neck brought into a straight line. A moan or grunt accompanies each inspiration, which, if it comes on at an early period, may be accepted as corroborative of a critical state. The nostrils are dilated, and the sides drawn rapidly backward and forward by the action of the air. A thin mucous discharge sometimes flows from the nose and the eyes, and the latter, becoming bloodshot, sometimes discharge from the first a muco-purulent secretion. The horns, ears, and extremities become cold, urine deficient and highly colored, mouth clammy, and skin tightly bound down, feeling dry and harsh to the fingers. If the spaces between the ribs or the region over the spine are pressed, pain is evinced, and not uncommonly occasions a low deep moan. When the ear is placed in front of the windpipe a loud rushing noise is heard in the passage by the transit of air through the tubes, the lining membranes of which are thickened, inflamed, acutely sensitive, and non-secreting. Louder sounds are also to be detected in the anterior parts of the lung, which are perfect; while respiration in the latter is silent, as a result of consolidation. As the lungs move by the process of respiration,

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assisted by the abdominal and other muscles, the surfaces, coming in contact with the sides of the chest, give rise to a sound not unlike the twisting of leather. This is often very general, and depends upon the extension of inflammation throughout the serous membrane.

In some cases only one lung is affected, when the respiratory murmur in the sound organ is much louder, in consequence of the increased amount of labor exacted from it. But when both lungs are affected, peculiar changes and complications set in as the disease advances. Portions may become gangrenous, or cavities are formed within the substance as a result of the process of suppuration, when the sounds called *râles* are heard, which materially differ in accordance with the size of the cavity, its opening, and nature of contents.

In some favorable cases the lungs gradually resume their action on the removal, by absorption, of the tissue thrown out by the process of inflammation. Progressive recovery takes place, the pulse becomes fuller, respiration slower and more regular, and the healthy murmur tolerably well established. At other times complete destruction rapidly ensues on the appearance of consolidation. Water is thrown out from the surfaces, and accumulates within the chest, and the animal dies, as it were, by a process of internal drowning.

There are other cases which indicate a tendency to protracted duration. Little progress, either toward death or recovery, takes place. Discharges of a fetid nature issue from the nose and eyes, appetite is capricious, and the animal becomes poorer every day. A troublesome sore cough continues, and not uncommonly portions of the disorganized lungs are expelled, with putrid pus. The temperature of the body is extremely low, and great prostration present. The animal is in a state of hectic or consumption, and speedily a fetid diarrhœa, with typhus symptoms, ushers in death.

Post-mortem Appearances.—Arising out of the manner in which the thorax is usually exposed by the knacker for examination, one of the first and most conspicuous indications of disease is the flow of fluid from the cavity as soon as an opening is established. The quantity frequently amounts to several gallons, and in it float large flakes of plastic exudation, the result of high vascular action.

When the ribs of one side of the chest, after being broken, are raised, some opposition to their complete removal is found to exist, in consequence of their inner surfaces having become united to the lungs by intervening tissue. This is observed to be of a reddish yellow color, and is known as false membrane, or, in other words, plastic material exuded in the process of acute inflammation. In this

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way the lungs are at times united to the heart-bag (pericardium), and also to the diaphragm or midriff.

If the organs are taken out of the chest, they will be found to be enormously heavy. The usual weight of the lungs of a large ox in health does not weigh more than eight or nine pounds; moreover, they float in water. On the other hand, however, the writer has found a single lung, when affected, to weigh nearly thirty pounds; while in cases where both were affected, they have reached the enormous weight of seventy-five pounds, and, of course, incapable of floating in water. The cause of this is the presence of exuded matter from the bloodvessels within the substance of the lungs. This destroys their elasticity and permeability, and produces the characteristic suffocation.

It is not generally known what is the structure of the lungs. To go into detail would be beyond the object of this paper, but a slight description or comparison is necessary for a proper elucidation of the subject.

Let the reader picture to himself a number of small caoutchouc bladders, terminating in hollow tubes, so as to resemble grapes upon their stalks, all descending from a single twig; let him also consider this bunch of hollow twigs and balls placed within a larger bag, and the spaces around and between each to be filled with some fibrous material, such as cotton wool. This serves to maintain a complete separation between each branch and ball, and act as a supposed matrix for the transmission of the nerves and numerous blood-vessels.

In our imaginary picture the twig is the *windpipe*, the smaller hollow stalks are smaller windpipes or *bronchial tubes*, and the hollow elastic balls are the *air-cells;* the cotton wool is the lung tissue or *interlobular substance*, and the outer elastic bag is the covering of the lungs, *pulmonary pleura.*

The mind must be carried still further, and suppose the blood-vessels to be charged, in the process of inflammation, with an unusual amount of blood. Their walls are dilated, and consequently also stretched; they become extremely thin, and allow blood material to exude. This settles within the interlobular substance, our typical cotton wool, and causes it to become hard and unyielding; while an excess causes pressure upon the air-cells, and by diminishing their size, induces either difficult breathing or total suffocation,

The effused matter consists of two kinds—a reddish-yellow-fibrin, and a deep red variety—blood corpuscles, etc.; the former surrounds the red in thin streaks, while the latter is in larger and more angular

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or round masses. This arrangement gives to the lung the peculiar marbled appearance as seen when cut across, and which characterizes epizoötic pleuro-pneumonia. This condition is known as *hepatisation*.

If the interior of the windpipe and bronchial tubes are examined, large quantities of plastic lymph will be found, sometimes blocking them, and presenting an entire counterpart of the whole ramifications. Recently, a very fine specimen was coughed up by a bull, which, after suffering from apparently slight illness for several weeks, and getting rid of the obstruction, began to thrive rapidly. In some of the more advanced stages of the affection, abscesses will be found in the substance of the lungs. These may communicate with bronchial tubes, or, as in rarer instances, with the pleural cavity, and giving rise to the sound which heard during life is termed the amphoric râle. At times these abscesses are separated from the healthy tissue by an accumulation of deposit; in other instances, parts of the lungs themselves are detached by sloughing or gangrenous changes. Collections of pus (empyema) are of seldom occurrence, death more frequently taking place before the abscesses can discharge any notable quantity.

When carcases are dressed by the butcher, any adhering false membranes which may be present are carefully pared off, and surfaces of the ribs scraped. This is also done with the carcases of cattle affected with tuberculosis, in which deposits, called in Scotland angleberries, are found scattered more or less over the lungs and other organs, as well as upon the inner side of the walls of the chest. The deception, however, is not successful, except with those who are ignorant of the practice. In a state of health the lining membrane of the chest is smooth, bright, and glistening; when the surfaces are dressed by the knife, they are rough and dull in appearance.

Reported disappearance of Pleuro-pneumonia Epizoötica during the operation of the Restrictions enforced on account of the Cattle Plague, and its Reappearance when those Restrictions were withdrawn.

On the question of benefit which resulted from the exercise of regulations limiting the movement of cattle throughout Britain, there can be but one opinion held by all who view the matter dispassionately. Although they had special reference to cattle plague, those regulations were serviceable in checking the removal of animals upon which there existed a doubt as to their freedom from disease generally. By their provisions, cattle from abroad were admitted only from ports where disease was known not to be present. During a considerable time, the trade in foreign cattle was almost suspended, except among those

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that were fat, in which case they were taken direct to the respective slaughter-houses and prepared for human food.

As regards Ireland, the importations also of store cattle were considerably diminished. Markets being closed, dealers were compelled to take their cattle direct to the place of sale, and there remain at least twenty-eight days before they could again be removed. They could not obtain permission to cross the borders from Scotland, nor *vice versa;* when they landed in England or Scotland, there they were required to remain. Each drover was bound to present his certificate of the health of the cattle before he could obtain permission and a license to move them inland. Gradually the restrictions were relaxed. First, cattle were allowed to go from Scotland into Northumberland, and afterward into one or more neighboring counties, and here and there markets were again opened for store stock.

When this was done, an impetus was at once given to the importation of stock from Ireland, and animals came across in large numbers, and were taken to occupy land from which their predecessors had been swept off by the plague two years previously.

The restrictions upon the movement of stock commenced in accordance with an order of the privy council, issued on the 11th August, 1865, but its provisions applied only to England. A week later, viz., on the 18th, however, there followed another order, citing the same clauses which were to take effect in Scotland. These provided that all persons who, from that date, had in their possession cattle laboring under disease, were required to give notice to the local authority, who, in turn, were empowered to appoint an inspector to decide the cause of illness, and exercise regulations in order to prevent a further spread of the plague.

Inspectors had the power of entering places where cattle were kept at any time, by which surreptitious removals were prevented. Diseased animals were to be separated from the healthy, and those which had been in contact with them, or in the same shed, &c., were not allowed to leave the premises without a license from an inspector. The order also provided for the burial of carcases, disinfection of hides, buildings, &c.

Ireland was next thought of, in an order dated August 25, which prevented the shipping of animals thence, from England, Wales or Scotland. Several orders were issued from this date until November 23, when power was given to the local authority of each district to close markets situated in their jurisdiction after the appearance of the disease. On the 16th of December, another order prohibited the

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removal of animals from one part of the jurisdiction to any other, without a license from an inspector appointed by the local authority Upon the strength of this enactment, which took effect from the 3d day of January, 1866, the movements of cattle were limited until the 1st of March in the same year, which was extended to June, and afterward, on the gradual decrease of the plague, successive orders revoked the stringent clauses of those previously issued, as circumstances appeared to justify.

Notwithstanding the exercise of these precautions, although they limited the spread of all contagious diseases, they failed to banish either pleuro-pneumonia or epizoötic aphtha from the soil. As far as evidences are obtained, pleuro-pneumonia epizoötica prevailed side by side with the cattle plague. In some instances aphtha preceded them. This state of affairs continued for months after the first outbreak of rinderpest, and doubtless intensified the havoc, as in the outbreak of 1745. Unlike rinderpest, which appears simultaneously, or nearly so, in a number of animals, pleuro-pneumonia epizoötica lingers about premises even long after its presence is apparently denied by existing conditions, and where proprietors had not suffered losses from rinderpest, or after being bereft, had replenished their stock as soon as the restrictions admitted of their doing so, they were doomed to suffer from pleuro-pneumonia.

Toward the close of 1866, reports were made of isolated outbreaks of pleuro-pneumonia epizoötica in country districts around Glasgow, where, for more than half a year, not a case had been seen. The dairies throughout the city were inspected, and declared to be perfectly free from any contagious disease. For a time cattle had been purchased principally from the neighboring breeders, but as soon as the restrictions were removed and markets thrown open to Irish and foreign cattle, dairymen commenced to fill up from these supplies the stalls which had been vacant so long. Then pleuro-pneumonia epizoötica again commenced its ravages, and continues to this day.

The following fact serves to show how stock is decimated by the non-observance of proper precautions: A dairy keeper found several of his cows successively affected with disease, and obtained the counsel of a friend who panted to dabble with the contagious malady under the assumed object of *making experiments*. For some time the two blindly labored over ground trodden years before by abler hands, yet with a false hope of success. At length the experimenter foolishly went direct from the place of contagion, without observing any caution, to his farm, and even among his own dairy cattle. At the end

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of six weeks, or thereabouts, according to records which were made at the time, he had to deplore the existence of pleuro-pneumonia epizoötica among them, which, as this is being written (July, 1868), has carried off more than half the whole number.

The prevalence of pleuro-pneumonia epizoötica in some districts, and its non-appearance in others, will be understood to be caused principally from the fact that in one the demand for and movements of cattle are much greater than in others, and in some there are no cattle taken, all being bred upon the spot. This applies with great force to Argyllshire, neighborhood of Kilcreggan, Greenock, certain parts in the counties of Aberdeen and Dumfries, etc. In these places contagious diseases among cattle are seldom or never heard of; and when exceptions to the rule occur, the results are definitely traced to the introduction of virus by strange animals.

The writer has been favored with information expressly for this paper, and bearing upon the subject of the transmission of pleuro-pneumonia epizoötica, by veterinary surgeons in extensive practice. It is given as received:

"VETERINARY ESTABLISHMENT, BOSTON, LINCOLNSHIRE, *May* 9, 1868.

"During the time restrictions were imposed on account of the cattle plague no cases of pleuro-pneumonia appeared in my practice; neither did I hear of any in the neighborhood.

"Since the markets were opened, I have had decided cases of pleuro-pneumonia, and last week ordered three animals to be destroyed. The origin of the disease was distinctly to be traced to the introduction of animals from *Irish droves*. Three distinct outbreaks of pleuro-pneumonia have occurred from the same cause since the restrictions were done away with. Have heard of aphtha, but have had no cases myself.

"JOHN G. DICKINSON, M. R. C. V. S."

"GRANTHAM, *May* 19, 1868.

"During the time rinderpest prevailed, other epizoötics were almost unheard of in this district. When the restrictions were removed, the traffic by rail and road re-introduced them, particularly pleuro-pneumonia epizoötica, which assumed a most virulent form, and ran its course in from three to ten days. Exceptional cases lingered as long as twenty days.

"C. J. WHITWORTH, M. R. C. V. S."

In the report by Mr. Whitworth, which is too long for this paper, particulars are given of several outbreaks. They occur at different times, from September, 1866, to April, 1868, a few weeks prior to the date of the report, and in most instances the origin of the disease is

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traceable to the passage of infected animals by rail or road through the districts or farms themselves.

"Whitchurch (Salop,) *May* 23, 1868.

"In answer to yours of yesterday, I beg to state that I never saw or heard of a case of pleuro-pneumonia epizoötica existing in my district during the time of cattle plague, neither has any case of the same disease occurred since that I am aware of; indeed, I have not seen a case since it was so prevalent around me before the cattle plague existed.

"I have heard of cases in Cheshire, some ten or fifteen miles from me, caused, as it was thought, by the introduction of *Irish stock.*

"WM. ANDREW CARTWRIGHT, M. R. C. V. S."

"Aylesbury (Bucks), 25*th May*, 1868.

"In answer to your inquiry, I have to state that, between the months of April, 1866, and August, 1867, there were twenty-nine cases of epizoötic pleuro-pneumonia at North Marston, a little village in this county. It was confined to three small farms in close proximity. Since that time nothing of the kind has happened there.

"During the present year I have only seen three well-marked cases, and they were on three farms situated miles from each other, where every precaution was taken for preventing its spreading. On the first signs of indisposition, the beasts (cows) were isolated a distance from the rest of the herd, and as soon as the disease could be satisfactorily prognosticated (? diagnosed), they were slaughtered.

"While the cattle plague was raging I did not see a single case of aphtha (foot-and-mouth disease), but now there are no restrictions, and cattle are allowed to be so freely (but carelessly) brought to fairs and markets, the disease has not only broken out in our dairies, but is extensively spreading through this part of the county, and I am now anticipating a return of the more formidable disease, pleuro-pneumonia epizoötica.

"HENRY LEPPEE, M. R. C. V. S."

"Crewe, *June* 2, 1868.

"In reply to your queries, I beg to state:

"1st, That I do not know of a single case of epizoötic pleuro-pneumonia having occurred during the operations instituted on account of the cattle plague.

"2d, That pleuro-pneumonia epizoötica has appeared in this district since the withdrawal of those restrictions, having been imported, I believe, from Ireland. I have heard of several stocks being infected in this country, but only two (about ten miles hence) have come under my personal notice.

"In February last, Mr. Brett had five animals attacked, all of which died. I inoculated thirteen remaining healthy, the whole of which escaped being attacked.

"In same month, Mr. Hughes had three attacked. I inoculated

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the rest (about sixteen), and, I believe they have since remained healthy. (Some accounts of my inoculations appear in Edin. Vet. Rev., 1863, p. 752, *et seq.*)

"I was recently informed, on good authority, that there was much pleuro-pneumonia epizoötica in some of the midland counties, in consequence of the importation of *Irish cattle.*

"For the safety of our herds, restrictive measures are most urgently needed.

"WALTER LEWIS, M. R. C. V. S."

"KELSO (ROXBURGHSHIRE), *June* 10, 1868.

"First of all, as regards your queries, I may safely answer them in the negative. A genuine case of epizoötic pleuro-pneumonia has not come under my notice since the spring of 1865. I hear, however, that it is reappearing in districts where it was unknown during the operations of the cattle plague restrictions.

"I have but little doubt but that the restrictions imposed at that time operated beneficially in preventing the spread of this disorder. Nor do I doubt but that, under certain regulations as to markets and importation of cattle, pleuro-pneumonia as an epizoötic might entirely be got rid of. This opinion I have held for many years.

"WILLIAM ROBERTSON, M. R. C. V. S."

"BUCKINGHAM, *June* 11, 1868.

"I had the pleuro-pneumonia at the same time I had the cattle plague. I lost several cows with it. In October, 1865, fourteen animals died affected with plague and pleuro-pneumonia. In October, 1867 (after the restrictions were withdrawn), I was called upon by the Buckingham Cattle Association to examine twelve steers, then in the possession of Mr. William Judge, of Hillesden, in the county of Bucks, four miles from Buckingham, a thoroughly good feeding and dairy county. The result of my opinion was that the whole were suffering more or less from the pleuro. Six were ordered to be killed, and the remainder recovered without the aid of medicine. The last steer was ordered to be killed on the 9th November.

"Some time afterward, fourteen milking cows got out of the yard among those which recovered. The consequence was, on the 30th January, 1868, I was requested to see two cows (never saw any worse in my life) suffering from the pleuro, both at the same time, and the lungs of one animal weighing sixty pounds.

"On the 3d of March, three cows attacked; two recovered, one died; six others ordered to be killed; and the disease continued to rage up to the 30th March.

"EDWARD BOND, M. R. C. V. S."

Mr. Bond is inspector to the Buckingham and Winslow Cattle Insurance Association, in which 1,300 head of cattle came under his supervision.

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"29 Princes Street, Perth, *June* 23, 1868.

"Yours duly to hand, and in answer to your questions on pleuro-pneumonia epizoötica:—

"1st. We had no pleuro-pneumonia in this district during the restrictions on the movement of cattle under the cattle plague act.

"2d. I think those restrictions of great benefit in the prevention of contagious diseases.

"3d. We have had a large number of cases since the withdrawal of those restrictions, which I attribute to contagion.

"4th. The cattle of the district are partly bought in, and partly bred upon the spot.

"G. STEWART, M. R. C. V. S."

"Ivy Street, Birkenhead, *June* 26, 1868.

"Before the rinderpest made its appearance there were a few cases of chest disease. I had only four, but was very busy with murrain or foot-and-mouth disease. When the rinderpest spread, all other contagious affections disappeared. Since then, until about two months ago, there was a lull. In one village, about four miles from here, every farmer has lost more or less cattle from pleuro-pneumonia. A Mr. P—— lost thirteen in two weeks, a Mr. T——twelve in the same time; in fact, all but about two or three have died.

"JOHN MIDGLEY, M. R. C. V. S."

"Grimshoe Hundred, Norfolk, *June* 30, 1868.

"1st. There were no cases of pleuro-pneumonia epizoötica in my district during the restrictions on the movement of cattle.

"2d. Those restrictions were of great service. With proper precaution on the movement of cattle, cases of contagious disease would be rare in England.

"3d. Since the withdrawal of restrictions in the movement of cattle, there have been no less than forty decided cases of pleuro-pneumonia epizoötica that have come under my notice in the district. I attribute the occurrence to the importation of *Irish stock principally.*

"4th. A few cattle are bred at home, but the greatest quantity are bought in at the back end of the year for the straw-yard. The principal supply is from Ireland.

"WILLIAM HARDCASTLE, M. R. C. V. S."

"Messingham, Lincolnshire, Kirton-in-Lindsey, *July* 6, 1858.

"1st. I am not aware that pleuro-pneumonia epizoötica existed in my district during the operations of the restrictions against the movement of stock.

"2d. I believe there was great benefit derived from those restrictions, as a means of preventing contagious diseases.

"3d. I know of a few cases that have occurred since the markets were opened and movement of stock resumed; these occurred from the purchase of animals from an *Irish drove.*

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"4th. Most of the cattle are bought as store beasts from the dealers in the beginning of winter, and sold out in spring. A great many calves are bought in and reared; the greater part come from Manchester and Sheffield.

"JOHN LOVITT, M. R. C. V. S."

"ALSTON, CUMBERLAND, *July* 5, 1868.

"1st. In this district, and for miles round, we were quite clear of epizoötic pleuro-pneumonia and foot-and-mouth disease while the restrictions upon the movement of cattle were in force. We had not been so clear for years. We are yet clear, but I heard of some cases of epizoötic pleuro-pneumonia last week upon a farm between Alston and Carlisle. The man had early in the spring bought some *Irish heifers*, to which he attributes the cause, and so do I.

"The cattle of this district are principally bred upon the place, but a number is bought in to graze.

"I attribute the greatest benefit to the restrictions on the movement of cattle, as a means of preventing the spread of those diseases.

"JOSEPH LITTLE, M. R. C. V. S."

"DUDWICK, BY ELLON, ABERDEENSHIRE, *July* 5, 1868.

"In reply to your favor, I have to reply that pleuro-pneumonia epizoötica has been unknown in this part of Aberdeenshire for several years, as farmers here are extremely cautious, and seldom buy in any cattle but from those parties who are in the *immediate* nighborhood, and whose cattle are known to be free from disease.

"GEORGE ROBINSON, M. R. C. V. S."

"WHITEHAVEN, CUMBERLAND, *July* 7, 1868.

"*Pleuro-pneumonia Epizoötica.*

"I will endeavor to answer your questions *seriatim*.

"I believe the above disease had no existence in this district during the operation of the restrictive measures you speak of. I am of opinion that those restrictions would have a decidedly beneficial effect in preventing the spread of contagious diseases amongst stock; but as this neighborhood, so far as I know, was quite free from such disease at the time, I cannot speak from any actual observations. I have not seen or heard of a case of pleuro-pneumonia epizoötica in this district since the withdrawal of those restrictions. The cattle of this district are, for the most part, bred upon the spot.

"JOHN FISHER, M. R. C. V. S."

"POTTERGATE STREET, NORWICH, *July* 7, 1868.

"There was no pleuro-pneumonia in my district, nor, as far as our insurance books show, scarcely in any other during the existence of cattle plague restrictions. Eczema epizoötica appeared in Norfolk of a severe kind about the period of the outbreak of cattle plague, and many herds I saw were suffering from it and cattle plague contemporaneously.

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"I do attribute benefit from the restrictions, or why the immunity? It may be urged, that during the prevalence of a virulent epizoötic no other diseases appear. I, however, believe in the restrictions, but the result may arise from the combined operation of the two circumstances.

"I saw many cases in February, March, April and May, but it is not so prevalent just now. I cannot satisfactorily account for their occurrence, but believe they are partly due to atmospheric causes and partly after the removal of licenses, to the greater amount of traveling imposed upon cattle, and to the increased want of care and attention which ensue. All the stores are brought from other counties; the larger number from Ireland.

"WILLIAM SMITH, M. R. C. V. S."

"65 BROUGHAM STREET, SUNDERLAND, *July* 7, 1868.

"Very soon after the cattle plague restrictions in reference to the movement of stock were fairly established in this district, pleuro-pneumonia epizoötica, aphtha, and other contagious diseases of cattle, entirely ceased. I am of the opinion that it was altogether attributable to these regulations being enforced that we still experience the singular immunity from the contagious diseases of cattle.

"Since the cattle plague restrictions were rescinded among home stock, I have not met with any special cases of pleuro or epizoötic murrain, but have heard of an outbreak of lung disease in the neighborhood of Stockton, but have not heard from what cause it originated.

"The store cattle stock are, for the most part, bred in the district (dairy cows being all bought in). About the beginning of last winter a few herds were bought in, feeders having a good crop of turnips, but this year there have not been any purchases that I am aware of. On inquiry, I am informed by farmers and others that they cannot venture to buy at present, having a great deficiency of pasturage, and also anticipating an inferior crop of turnips.

"THOMAS THOMPSON, M. R. C. V. S."

"DUNSCORE, DUMFRIES, *July* 14, 1868.

"In answer to your first question regarding pleuro, I did not know of one single case in all my district during the restrictions enforced against the movement of stock during the cattle plague.

"2d. I think the restrictions are a preventive. Last year, when cattle were permitted to move from place to place, it then appeared in my district of practice, and from cattle bought in Dumfries market. These cattle were Irish, and bought in the month of May by a farmer. He had upward of one hundred head of cattle on his farm, but not all Irish, being a mixture of Galloway and Ayrshire. Pleuro continued about the farm till April last. I lost very few. I used every preventive means as well as the treatment of my patients.

"3d. It has also made its appearance in another farm at a distance of three miles from the first, but not belonging to the same person. It was brought in the same way as above described, the farmer being a *cattle dealer*.

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"4th. We have had no foot-and-mouth disease since the rinderpest. One reason is, we have had very few sheep from the north since that time, there being more sheep bred here than the farmers could keep. Previous to the rinderpest we had it every year, and always along with the sheep brought from the north fairs.

"JOHN KIRKPATRICK, M. R. C. V. S."

Mr. A. Robinson, M. R. C. V. S., Greenock, informs me that no pleuro-pneumonia has come under his notice since a short period before the appearance of cattle plague, where it was traced to the introduction of Irish cattle. Since that time the cattle of the district have been bred upon the spot, and therefore have remained free from the scourge.

Mr. Hall, M. R. C. V. S., Stockton-on-Tees, reports in the Veterinarian for July of the present year, that pleuro-pneumonia epizoötica had appeared in his district; due, it is believed, to the purchase of infected Irish stock in Stockton market. In a herd of twenty animals, principally dairy cows, fifteen had been carried off, three remained ill, and two only had recovered.

Mr. Charles Hunting, M. R. C. V. S., South Hetton, near Durham, writes as follows:

"There were no cases of pleuro-pneumonia epizoötica in this district during the operations of the restrictions upon the movement of cattle under the cattle plague act.

"I am quite of opinion that those restrictions were very beneficial in preventing the propagation of all contagious diseases amongst cattle and sheep.

"I am not aware of a single case of pleuro-pneumonia epizoötica in this locality affecting our cattle since the withdrawal of those restrictions.

"A goodly number of animals are imported here, chiefly from Ireland, for feeding purposes; those used for dairy purposes are mostly home-bred animals."

Although many of the writers here testify that no case of pleuro-pneumonia has appeared in their locality, it is not to be supposed such is literally correct. Each correspondent has written only what he absolutely knows. Hundreds of dairy and even farm stock are seized with pleuro-pneumonia, &c., of which the resident veterinary surgeon knows nothing. The moment suspicious symptoms appear, the animal is slaughtered and its carcase disposed of. The practice is not confined to one locality or to persons. The writer is acquainted with a small town, the presiding magistrates of which are farmers, and do not object to follow out the same plan. Until all losses from

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contagious diseases are mitigated by direct legislation and compensation granted, the desire to avoid them by every available opportunity will be as keen in one circle as another. A central organization would work infinite good, and gather the assistance of all, each person becoming an interested party in the collective welfare.

Treatment of Pleuro-pneumonia Epizoötica.—The result of all measures in medical treatment hitherto adopted for the cure of this affection has plainly demonstrated that drugs have no effect in staying its progress. A specific poison exists in the blood, but of what nature and form, whether fungoid, parasitical or chemical, is unknown; and until we obtain some knowledge of its characters, besides its fatality, we are not likely to eradicate it.

Professor Polli, of Milan, and with him M. Pasteur, have done much to elucidate what may be done to arrest the poison germs of several kinds under certain conditions. During the cattle plague great reliance was placed upon the use of sulphites recommended by the former. These gave way, being unsuccessful, and carbolic acid or the carbolates were afterward tried, but neither produced the effect so much desired. These were measures which were advised upon the strength of an increased acquaintance with the nature of the malady. In pleuro-pneumonia epizoötica, after repeated experiments, similar results have been manifested; animals recovering as well, if not better, without any interference beyond what domestic treatment provided. Years ago, on the continent, the character and phases of pleuro-pneumonia epizoötica were investigated, and researches extended from time to time by the most eminent veterinarians. They had every opportunity and resources, as well as the most powerful aid and encouragement, unknown in Britain. What has been done here, therefore, may be strictly pronounced as going over the same ground again with fewer appliances, and all to no purpose.

There is, however, one particular, which, as far as we in Britain are concerned, should be settled at once, and it brings us to a consideration of *the best means for the eradication of pleuro-pneumonia epizoötica.*

As in all contagious affections, especially like that we are considering, whose essential character is one of great subtlety, it should be our aim to anticipate their attack, and thus secure the safety of other animals. When the disease becomes evident to an ordinary observer, those which are beneath the same roof are not safe. They may escape if removed without delay, but the probability is that they will

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not; while the poison-germs are spread by the act over a still greater area. Delay, therefore, makes the danger.

The point alluded to is that of temperature of the body as influenced by disease. In cattle plague and other specific affections, long before the ordinary symptoms make their appearance, an increase of temperature takes place, and the writer has seen instances where he is justified in recommending that opportunities should be granted for the further testing of the matter.* If this question can be thoroughly established, many of the means of avoiding losses would be available. In order to prove it, some well-regulated experiments are required, and the Highland and Agricultural Society of Scotland, demonstrating, as it has so recently and substantially, by establishing the chair of Cattle Pathology, that it is the champion of the best interests of agriculture, would do well to place at the disposal of a scientific and determined veterinarian the requisite material for the purpose. Whatever time and money, which need not be immense, is expended in the observations, the nation would reap an abundant profit.†

Auscultation and Percussion.—The means by which we estimate the condition of the lungs are of two kinds, viz.: auscultation and percussion. The first consists of ascertaining and comparing sounds emitted during respiration by placing the ear directly, or indirectly by means of an instrument called a stethoscope, to the sides of the chest. The second consists in striking the ribs in various ways, and eliciting sounds in order to confirm or negative those heard in the first instance. A description of these sounds would be too tedious, lengthy and uninteresting to the non-professional reader, particularly in the absence of preliminary anatomical as well as correct physiological knowledge.

Auscultation and percussion should be frequently resorted to when animals are suspected as doubtful. The practice would enable the owner to add another weapon to his *armamentarium* with which to meet the subtle foe, and cut short its progress. In conjunction with observations on temperature, invaluable aid might be obtained by limiting the losses probably to the first victim.

Suppression of Cattle Traffic.—Unless measures to limit the movement of cattle over the United Kingdom are conducted in a less

* The Thermometer as an Aid to Diagnosis. Warne & Co., London.

† It may be inquired here, "Why have not practitioners settled this point?" The answer is plain; they have neither time, opportunities, nor money to spare for the purpose. When veterinary surgeons receive greater *inducements to become more scientific*, the world may hear more of discoveries in veterinary science in Britain.

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slovenly manner than they were known to be in certain places during the force of the orders of the privy council, bearing date of December 16, 1865, they had better not be instituted. The writer was occupied some time in the inspection of cattle, and granting licenses for their removal inland, and upon several occasions Irish dealers refused to wait for the required document which was to pass their cattle to their destination. Some laughingly said, "Well, I can take it; but I'll assure yer honner I do not require it. I have never been asked for a license yet." Many have pulled from their pockets huge rolls of licenses, obtained from time to time, bearing the writer's signature, and which had never been inquired for, looked at, or detained by a single government official.

It is also known to the writer that in certain instances inspectors had several young men, competent and *non*-competent, to examine cattle in their name for suspected disease, and to such was delegated the inspection of hundreds of animals arriving from abroad, coastwise and other places. Sometimes when cattle arrived the delegates were abroad, and, if found, signed licenses where they sat, or informed the applicant that blank forms with their signature might be obtained at a place they named, and which the dealers might fill in themselves. When the writer entered upon his duties, at a certain place, he was frequently asked for *two* forms with his signature, either of which the drover or dealer could fill up and use as seemed best to him afterward. Restrictions are of little use unless they are implicitly carried out. If inspectors are allowed to appoint and employ young men and boys to do their work, and drovers to travel the roads with cattle during the existence of a plague, without being asked a question, the proceedings of My Lords of the Privy Council are not of much service. If a strange hawker or auctioneer were to appear in the district he would be quickly desired to produce his license; but a disreputable drover, not worth a penny, may be allowed to travel unmolested repeatedly without question, and to the imminent dread of the country at large.

The influence which was exerted by recent legislative measures toward checking the progress of the plague among cattle, as well as contagious diseases generally, cannot be said to have been of the most successful character. The orders in Council were doubtless too long delayed, and even then were not sufficiently comprehensive. Hundreds of cattle were brought from Ireland in which there existed no signs of plague; but, nevertheless, as is proved in a way too sorrowful at the present time, many bore in their bodies the seeds

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of pleuro-pneumonia epizoötica which no man breathing could distinguish at the moment. These were allowed to go abroad, and disseminate disease wherever they went. The orders only applied to cattle plague, and inspectors were powerless to avert the consequences of other affections. Had they been allowed to include pleuro-pneumonia epizoötica and epizoötic aphtha, as well as small-pox in sheep, these maladies, like cattle plague; with no more expense, little extra labor, and genuine surveillance, we might have been able to pronounce, instead of the reverse, the total absence of contagious diseases among cattle and sheep.

However, benefit did actually arise from the restrictions placed upon the movement of stock, but indirectly. Dealers and owners generally exercised at first care in the cattle they brought, but afterward they grew indifferent. Fear exerted in the outset a powerful influence, and the knowledge of certain men being fined threw terror over others. The period of incubation, which characterises pleuro-pneumonia epizoötica, eminently admits of cattle being brought from an infected stock in Ireland or elsewhere, passing an inspection on landing in England or Scotland, and moving hundreds of miles, and even remaining weeks upon their new premises before disease appears. In order to cope with such a malady, mere suppression of cattle traffic will not effectually stop its progress. Having an existence, we must also admit that it also exists in some other place; yet, in its latent form, it defies an army of inspectors, and passes beneath their very noses. Regulations should enforce that all licenses granted for the moving of cattle should be registered, by preservation of a counterpart bearing all particulars and a consecutive number, &c. By this means, when disease breaks out amongst a herd, their route, and even the very place from whence they originally started, could be traced, and, at the same time, in many instances, other diseased animals, which, by immediate slaughter and disinfection of buildings, &c., would effectually prevent the likelihood of further spread. Infected buildings, and even districts, should for a proper time be declared closed to the admission of cattle. A little wholesome stringency, early and systematically adopted, although in a measure inconvenient, would always prove ultimately profitable and safe prospectively. Indecision and selfish regard for present small profits in the matter in question are safe precursors of future wholesale and even general losses. Suppression of cattle traffic, without strict investigation and other collateral measures, will not ensure the extinction of pleuro-pneumonia epizoötica or other contagious diseases.

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Inspection of Markets.—As far as the writer has acquaintance with the working of this principle, he has the greatest reason to look upon it, when uncombined with other assistance, as little better than a farce. He has known a market in which some thousands of sheep and hundreds of oxen and dairy cattle are exhibited each week, and, beyond a few sheep nearly recovered from scab, nothing has been challenged for months; yet from the same market whole dairies have been replenished, and the new cattle introduced have first fallen victims to pleuro-pneumonia epizoötica, and afterward communicated it to the previous occupants.

A man may walk through the markets, or stand at the gates and scrupulously examine each animal as it enters, and he will fail to detect pleuro-pneumonia epizoötica. It is not to be found in the haste and rabble of a market, and any limit which may take place in the spread of the disease by the adoption of such an imperfect system alone as the inspection of markets, in the opinion of the writer, does not occur from any real efficacy as a direct proceeding, but from fear of the consequences, if it should be afterward found the owner had at the time diseased animals in his possession.

The measures that are most likely to eradicate pleuro-pneumonia epizoötica from Great Britain will also be subservient to the complete extinction of *all* contagious diseases. They must, however, be in advance of either inspection of markets or suppression of cattle traffic. The foreign as well as the home trade must be brought under their influence. Unless the continued accession of virus is prevented from abroad all home measures are of little use, but an interruption to trade and productive of great disquietude. The principles may be embodied under several divisions, which are as follows:

1. Foreign Trade.

First. It appears that upward of 40,000 head of cattle are annually imported for supplying dairy and feeding stock, and these are chiefly obtained from Holland, where pleuro-pneumonia epizoötica may be said to be never absent. These cattle are inferior to our own, and indiscriminately exposed in our markets, and driven over the length and breadth of the land, scattering disease far and wide. In the uncontrolled system of cattle importation, amid the extensive wants of the country, from one end to the other, and impossibility to detect disease immediately the animals are landed, great mischief arises. The first care should be to ascertain that all ports from whence cattle are to be shipped are supplied from healthy districts, and this can be

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readily done in most countries except Holland, where measures are loosely carried on, as in our own country, for which she suffers, and rightly. All countries where disease is known to be present should be scrupulously avoided, and our ports declared closed against them.

Second. Cattle brought from such ports as are declared infected while the cargo is afloat should not be allowed to land at the usual places of debarkation, but at some special spot, where they may be subjected to a proper surveillance or immediate slaughter. If traffickers are honest, they would not attempt to introduce cattle from such ports, or if in ignorance of the presence of disease there be a lawful excuse, they could not object to the exercise of proper precautions for a country's good. Should they desire to run the blockade, the expenses consequent upon a just period of quarantine or forfeiture of the cargo would teach them better for the future. In the opinion of the writer the vexed question of quarantine has been viewed in the wrong light. It is a proceeding to be instituted only as a terror to evil-doers. Honest traffickers would not come within its power. As in the case of cholera and other highly contagious fevers of man, information of their presence in a given district or country of the continent is obtained, and immediately thereafter vessels sailing hence from those ports only are required to observe necessary instructions in order to prevent the introduction of the disease. The same would apply to cattle with much greater effect and profitable results. The current of traffic would consequently be turned toward those places where healthy cattle only are to be had; quarantine would not be courted twice by the same individual; and he would doubtless feel himself interested to publish an account of his misfortunes as a matter of precaution to his friends.

Third. Cattle of all kinds that are found, when landed, to be unmistakably affected with pleuro-pneumonia should receive summary treatment. Those but slightly affected and in good condition might be used as human food, otherwise they would waste and become unfit in a short time. Those suffering acutely, in most instances are best slaughtered and buried at once; while they live they are continually manufacturing and distributing the poison to others. Healthy or apparently healthy cattle arriving by same cargo are to be segregated as thinly as possible, in order to diminish the chances of further losses from direct contagion, and only allowed to pass when, by the expiration of time, they can be declared free.

Under these circumstances the expenses should fall upon the importer, who might be allowed the option of the whole being slaugh-

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tered; but all animals actually diseased should be forfeited. The principles of free trade are doubtless a great boon to the country; but as the national wealth is the sum total or mirror in which is reflected all our individual successes and prosperity, we pursue, by unfettered importation, a system contrary to the objects of those principles which build up the whole, and that will ultimately sap the structure to its very foundation. By the limit of cattle importation to healthy districts contagious diseases must inevitably disappear. Prevent the constant accession of contagious virus, and the disease as it exists here, dealt with by home measures and sanitary regulations, must become milder as it prevails, and confined to areas of limited extent.

Open all ports to all countries and to all comers, and an army of inspectors may be drawn up in array, but their actions may be likened to a fight in the dark. Importation properly regulated, will strike the death-blow to the prevalence of contagious diseases in Britain, and simplify as well as strengthen the efforts of an internal organization. As Ireland at the present time is well known to possess permanent stations for pleuro-pneumonia epizoötica, that country should be laid under such regulations as would prevent its introduction to England and Scotland, as it is at the present time effected. The secret of safety does not lie in keeping a host of inspectors to await here the arrival of boats, and inevitably pass animals in which a cursory glance cannot detect the signs of disease. Money enough has been and is at the present time wasted on a useless and inefficient system of inspection, that we can safely dispense with without suffering inconvenience thereby. Rather let the importation be limited to healthy districts and internal measures properly arranged and strictly enforced, and reasonable hopes of success may be then entertained.

2. Home Trade.

If we continually permit our cattle to be indiscriminately exposed to others coming from abroad, as we are now doing, it must be taken for granted no relief in the effects of pleuro-pneumonia epizoötica will be manifest. Without measures already insisted upon, whereby the foreign trade is regulated, the home trade is in constant danger. It is not too much to state that no measures short of absolute coercion would suffice to eradicate it from places where it has entered, nor would those measures, if rendered doubly despotic, be any more successful in preventing its reintroduction from time to time, excessive as the demand is for beef as human food.

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A close surveillance by police or *cordons militaires* of our farms and villages, which characterize countries on the continent, would prove here a most grievous infliction and interference with the rights of man as viewed by British ideas of freedom. Yet there is abundance of proof that such measures succeed where they are carried out, and clearly point to the efficacy of a central point of action and presiding power of management. It is seldom that measures are satisfactorily carried out where too many conflicting opinions are allowed to weigh in the scale. Our ideas of liberty impel us frequently to act very much against others while we benefit ourselves; but advanced civilization, of which we can make our boast, does not authorize our cultivating a practice which, although ministering to our profit, shall annoy or put to inconvenience or loss an immediate neighbor. The principle of our home trade in cattle, however, permits all this. One man cultivates with impunity the manufacture of contagious diseases, and his immediate friends have no redress. If the former had a noisy dog, a tall smoky chimney, or a clattering forge, &c., his neighbors might raise an action for nuisance; but he may accumulate animals in his trade of cattle-dealer and farmer, dairyman, &c., manufacture and propagate pleuro-pneumonia epizoötica, aphtha, small-pox, mange, scab, glanders, and farcy, and no one would scarcely think of moving in the matter, save to utter the usual lamentations for a result almost inseparable from the conditions contained within the lease of the farm.

To provide a *direct* remedy for the eradication of pleuro-pneumonia is not an easy matter. Opinions are divided as to the source from whence the power should emanate. A district might be governed by common consent of the inhabitants, but on its outskirts there might be sufficient apathy to endanger it continually.

The most feasible plan appears to be this: A permanent veterinary department should be established under government, who are to appoint local authority and inspectors for each district, and owners should be encouraged to report the existence of disease among their stock. The inspector, who is answerable, not to individuals, but to the local authority or government, decides at once the case, or adopts such precautions as are needful until a safe decision can be arrived at. When simple maladies are observed, suitable curative measures are adopted, and the case becomes one of ordinary professional character.

If contagious affections are discovered, the inspector acts as a public servant, segregates or destroys animals, as the case may require, taking particulars of the outbreak, and furnishing a copy to the owner

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and head-quarters, the former to receive compensation to the extent of two-thirds the market value. To provide the necessary funds to carry out precautionary measures, the district for which the local authority acts might consent to the levying of a rate upon the acreage, or, as it is proposed in Ireland, upon the rental of the farms. Such a plan would provide ample funds to remunerate an inspector, who would be enabled to live and devote his entire attention, as is not now the case in agricultural districts, to the stock which represents so much of Britain's wealth. Direct taxation of the agriculturists, in accordance with the amount of stock they breed and keep, would probably answer best. In the United Kingdom there is estimated to be about 8,500,000 cattle, which, valued at ten pounds per head, would represent a sum of 85,000,000. The loss by disease of all kinds amounts to over 3,000,000, one-half of which is due to pleuro-pneumonia epizoötica. Each animal taxed at three shillings per annum would raise nearly 1,500,000 of money, and it could not be considered extravagant if double that sum were charged, whereby pecuniary losses would be avoided and spread of disease prevented. The insurance companies of the past and present day charge much higher premiums with less risk; but a government system, properly organized, would be more effective and certain for all purposes, while a general blessing would follow its operations.

Among 40,000,000 sheep and 1,500,000 pigs, we lose also 3,000,000 by disease annually, all of which, by proper management and government aid, might be reduced to a trifle, and secure happiness to thousands who are now sinking into despondency from their losses.

The generally healthy state of Britain and its insular position, in the absence of importation, would effectually prevent the introduction of contagious diseases among cattle. They do not appear, here as a rule, therefore the measures recommended are only intended as a countercharge to the risks to which we are constantly exposing ourselves by a free trade in animals.

There is a grievous offense being daily committed, which also tends very much to the certain spread of contagious diseases, viz., the low dealers in cattle. These men haunt the byres and farms of people who sell to them their diseased animals, which they travel or carry in the night time, often through districts thickly beset with cattle. When disease breaks out under such circumstances, non-professional observers for a long time cannot decide how contagion has been brought, and frequently are loth to believe that it is the cause, in the absence of palpable proof. To meet this difficulty, all cattle dealers

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should be compelled to take out a license, paying not less than twenty pounds per annum. Such a step would act as a protection to the lowest dealer, and prevent the hawking about of diseased cattle. Butchers should also be required to keep a register of the animals they purchase, that diseased carcases could be traced to the original owner, and indemnity secured against loss. *The travelling of all animals affected with contagious diseases should be rendered illegal.*

A short time ago, *an inspector* of a certain market in Scotland, who also occupies a dairy farm, heard that pleuro-pneumonia epizoötica had broken out among the stock of a neighbor. In his official capacity he brandished the arm of the law, and rendered himself absurdly conspicuous in quoting the power he could use if he were willing. The farmer had been getting away his cattle as best he could, without consulting the inspector. This was the grievance. In a few months the inspector experienced a sudden desire to dabble among cows affected with pleuro-pneumonia epizoötica, and occupied himself for days without intermission among them, going to and from his farm during the time. Shortly the disease appeared in *his* stock. He then removed the animals, some to the butcher in a neighboring village, and the rest were carted along the road for several miles to a convenient place for treatment. Some recovered, and were returned in like manner; those which died were conveyed in the manure to the farm. This inspector was also in the habit of *going to and from the market two or three times a week during the period his own cattle were ill and receiving his treatment, and it may be taken for granted that, as he went direct from the buildings, no change of dress was made.* A letter in the writer's possession, written by this inspector, concludes as follows: "My firm conviction is, that pleuro-pneumonia will never 'entirely subside' until measures are adopted to prevent the spread of animals laboring under the disease; and it is now for the public to say whether such measures shall be instituted, or each individual allowed to exercise his own judgment in selling or killing, and disposing of his diseased animals as at present."

If the public are allowed to give judgment in this important matter, it would amount to this: Laws intended to regulate the nation's weal in cattle disease questions should not favor inspectors more than others; and when inspectors are appointed they should be prepared to give proof that they understand the characters of contagious diseases, required to execute the commissions in *propria persona*, and not be allowed to make choice of young, inexperienced men to perform the

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work, who can be obtained for a song, while they pocket the government allowance. If they have so many irons in the fire at the commencement, there is no need to place another in their hands which is first allowed to burn. The public welfare is important, and should not be left to boys and other careless and inexperienced persons.

A great deal of good might be done in the way of eradicating pleuro-pneumonia by the establishment of *local quarantine and inspection*, conducted under the auspices of farmers' clubs and agricultural societies. Cattle, etc., sent to certain markets might be admitted only on the strength of a certificate of health from the resident inspector. The system, however, is most likely to fail, on account of outside carelessness, unless the greatest amount of caution is exercised in fresh purchases and the admission of traveling cattle through the district. In Aberdeenshire the system has been of great service.

The *cleansing of railway trucks and sidings* should be regularly enforced under the supervision of an inspector, who attaches a ticket, certifying his examination after each operation; the ticket to be retained by the inspector who receives the cattle at their destination. Hay and water are necessary on all long journeys, which should be scrupulously attended to.

To eradicate pleuro-pneumonia epizoötica or other contagious diseases from this country, measures which regulate the home trade should act in strict conformity with those which preside over the foreign traffic. While the former ministers toward placing a limit around the point at which contagion appears by which its force and effects would be paralyzed, the other would effectually, at least in a majority of instances, seal the country against the further admission of disease in a more active state.

While ports are open and inspection is no better carried out than at present, thousands of pounds may be uselessly squandered in livery and red tape, inspectors and licenses, and at the end of ten or twenty years the country will be as bad as at the present time. The first aim is to deal stringently with importation, to guard against further admission of disease; next organize the surveillance over internal traffic properly, moving animals only (as much as possible on the voluntary system), armed with a certificate of health. The whole, by a little thought, may be made to work profitably, and maintained at little cost and inconvenience.

Inoculation as a preventive of Pleuro-pneumonia Epizoötica.—The system of inoculation as a preventive of pleuro-pneumonia

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epizoötica, although in a few instances successful terminations have marked the proceeding, in the main is not a wise one. To inoculate animals as a means of reducing contagious diseases is in reality to increase their prevalence. While the disease is being communicated artificially to each animal, fresh seeds are being constantly manufactured. It is, therefore, diametrically opposed to eradication, and should not be pursued. If isolation, and care in the traffic of animals in the home and foreign trades, will not stamp out pleuro-pneumonia and all other contagious diseases of cattle at the same time, no other system, neither those of medical treatment nor inoculation, can offer the least service. Security lies only in preventing the admission and spread of disease, not in treating it medically, or dabbling in such experiments which propagate it over a greater area, under a mistaken idea that the results are valuable additions to science.

Some of the metropolitan dairymen recently informed the writer that they are constantly in the habit of resorting to inoculation, and derive very satisfactory results. From a due consideration of all the circumstances, it appears that, so long as inoculation is practiced among the cattle by the use of virus obtained from those dying in the neighborhood, and no diseased cattle are purchased from abroad, there appears to take place a decline in the severity of the disease from time to time. The symptoms are mild in character, and few deaths really occur either from the operation or among those which recover and are subjected to subsequent contagion.* But one sad result is inevitable, and that is, when fresh introduction of cattle from Holland or Ireland takes place, among whom pleuro-pneumonia epizoötica is prevailing, the disease makes alarming progress.

If we could inoculate all the cattle in Britain at once, and resolve to import no more from abroad, pleuro-pneumonia might disappear; but, as it is, inoculation of cattle and unrestricted movement only propagate the disease, and render it a decided impossibility to free the land of its presence.

District inspection of Cow-houses (Byres), &c.—One of the most prolific sources of pleuro-pneumonia and other contagious diseases among cattle are the cow-houses of our large towns and cities. The causes of its propagation lie in the free and almost uninterrupted manner in which the owners can dispose of their diseased stock.

* In many instances cattle, after inoculation, do not show any symptoms or suffer any inconvenience from the operation. It is not too much to assert that numbers have already gone through the mild stages before landing in England; hence the apparently favorable results of inoculation in the metropolitan dairies. In the writer's experience, there is nothing to encourage the adoption of the operation as a means of eradicating pleuro-pneumonia epizoötica.

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Our medical officers of health, or the policemen who are deputed, really perform but a portion of the necessary good when they visit the cow-sheds in their district. They may enforce the prescribed cubical area for each animal, *if they are able to measure it*, and also enjoin strict orders of cleanliness; yet, notwithstanding this, the owners may send away apparently healthy cattle, and propagate by them disease in its worst character.

This is a point which requires a special mode of dealing. Until inspectors are chosen for their well-known capabilities of detecting disease, and they are allowed to enter every cow-house in their respective districts, note the number of inmates, and demand the cause of removal of each, as well as its destination; until this is done collaterally with an improved careful system of importation and regulation of the traffic among our home stock, owners of cattle cannot reasonably hope for success in any other measure aimed at the eradication of pleuro-pneumonia epizoötica from Great Britain.

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ON THE MANAGEMENT OF POULTRY.*

By Robert Hutchison, of Carlowrie, Kirkliston.

The most superficial observer of agricultural affairs in Scotland cannot fail to be struck with the small and constantly decreasing number of poultry to be seen about our farm-steadings generally; and yet this diminution in the stock formerly kept, does not arise from any corresponding depression in the demand for either eggs or dead poultry. On the contrary, the demand for fowls and their produce, as a food supply for the people, is large and steadily increasing, and the prices paid for good birds (dead or alive) are frequently so high as to induce our continental neighbors to forward large quantities of poultry of all descriptions and qualities to supply our markets. In 1867, besides the large number of eggs brought from Ireland, there were imported from abroad, according to the Board of Trade returns, 438,878,880; a large number, certainly, and representing, in money value, no less than £1,105,653 sterling. This item of our imports shows an increase of fully 400 per cent during the last ten years. The returns of the Board of Trade have not noticed the importation of fowls for some years past; but we have very good data for calculating that their present annual import value exceeds £100,000, thus making a total of £1,205,653 paid by Great Britain to foreign countries (exclusive of a large sum to Ireland) for poultry and eggs annually. And why should this be so? Are our home breeders of poultry so negligent of their own interests as to allow this large amount year by year to go past them wittingly, or do the expenses of rearing and feeding in this country not afford a margin to compete successfully and profitably with the foreigners in our own home markets? Taking into account the statistics we have given, and bearing in mind the far higher prices given for our own "home-laid" eggs, on account of their superiority of flavor and freshness, not to speak of a certain prejudice in their favor, from the knowledge of the clean and whole-

* From the transactions of the Highland and Agricultural Society of Scotland.

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some feeding of the fowls in this country; and having a due regard, also, to the increasing demand there is for poultry, as a delicacy on the tables of the wealthy, and as a necessary for the invalid and child of tender years, it does, indeed, seem that if our farmers would devote to their poultry yards a fraction of the time and pains that they bestow on their other live stock, they would find them return, at least as large a profit, in proportion to the risk and outlay upon them, as any other department of the farm.

But, in order to make the breeding and rearing of poultry on a more extended scale remunerative on an ordinary arable farm, the supervision of and careful attention to all details connected with the yard must not be deemed unworthy of the personal superintendence of the farmer or his wife, to see that the fowls are comfortably housed and regularly fed, the different breeds kept apart, and the cocks and hens properly mated; for it is owing in a great measure to these matters having been completely neglected, and any sort of treatment deemed good enough for poultry, that our barn-door fowls have become such a mongrel, degenerate race, worth little either as "layers" or as "table birds." To ensure a profitable result from the extended keeping of poultry on a mixed farm, proper accommodation for keeping the breeds separate (if required) and for hatching are indispensably requisite. These need not be costly erections. A wooden "lean-to" shed, put up against any of the steading buildings (if against the wall of a boiler-house or engine-shed so much the better), with an inclosed yard in front, the house and yard being subdivided into as many sections as there are different breeds of fowls, is all that is requisite. The house for each breed kept should be ten feet square, with a roof sloping upward, from six feet high in front to about ten or twelve feet high at the back, with a good large ventilator over each division or pen. The yards should be tolerably large (twelve feet by six feet at least), and covered with fine gravel, which ought to be frequently changed and refreshed, say once a week. The partitions between the yards of the various breeds should be lined with wooden planking (ten-inch white wood planking, one-half inch thick, suits best), two and a half feet to three feet high from the ground level, to prevent the cocks seeing one another. Above that height wire-netting is a sufficient protection; and each yard should be furnished with a "dust-bath" (composed of an old tub or half-barrel sunk into the ground, and filled with dry cinders), a drinking fountain, and feeding troughs. In the houses, the roosting places should consist of poles of young larch trees or other thinnings

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from the woods laid transversely upon trestles, about three feet from the ground at most, with a sparred walk or ladder for the fowls leading up to them. The nests and hatching dormitories may be arranged about the same height from the floor, in a single tier along the walls of the house. The walls and ceilings of the houses should be regularly white-washed with hot lime, and both the houses or pens and the out-door yards should be carefully cleaned out at least once a week. If a separate hatching compartment is attached to any poultry-yard, it should be furnished with two or three tiers of wooden "pigeon-hole" inclosures, from sixteen to eighteen inches broad by fourteen inches high; and each nest should have a sparred door to fix on, so as to secure the hen-bird upon the nest, while affording her good ventilation.

The houses having been built, the first point to be attended to is the selection of a proper person to look after the fowls; and on most farms it would be advisable to combine that work with the dairy-maid's, or with some other department of farm labor, as few farmers would keep a sufficient stock of poultry to require a person's constant attendance. Indeed, we do not think that upon ordinary mixed farms it would pay to keep a regular "hen-wife." The number of poultry to be intrusted to the care and whole time of such a servant would imply the purchase of part of their food, as the produce of the farm economically suitable for the poultry-yard would not usually suffice for the maintenance and constant sustenance of such a number of fowls; and if a farmer has to go into the market for food to supply his poultry stock, it invariably follows that he does not reap the same profit (if it pays him at all) as when his fowls pick up their food, and in a great measure maintain themselves in health and vigor upon what would otherwise be lost to him.

Having given due regard to the proper supervision of the poultry establishment, and comfortably housed the inmates of that department of a mixed farm stock, the next important point to be observed is to kill off at once all the cross-bred mongrel stock already on the farm, and to supply their places with two or three good and distinct breeds. Probably the best varieties for general purposes are the colored Dorking, the Brahmapootra, and the Houdan. We mention these sorts because the vicissitudes and alternations of temperature and moisture in our climate frequently affect seriously the health and welfare of a poultry-yard; and we can attest from experience that the varieties above named have, in our case, proved very successful, and are highly adapted for more general culture and extensive use on

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mixed farms in almost any situation, soil, or locality. The great difficulty which poultry-breeders have to contend against in this country is damp; for much rain, and above all a wet soil, is very deleterious to all kinds of poultry. At the same time, if the houses and yards are thoroughly well-drained, and if, where the soil is a stiff clay, the yards are covered a foot deep with dry fine gravel, any of the breeds we have named will be found to thrive well; while upon a wet soil, we would chiefly recommend the Houdan alone, seeing they are uncommonly hardy, and economical fowls withal; the Brahmapootras next, and probably we should recommend the Cochin-China varieties next in point of merit of hardihood. The Dorking fowl does best upon a light gravelly soil; but even it will be found sufficiently hardy, if the precautions we recommend be taken. The Houdan is perhaps for all purposes the very best breed which a farmer can select, as it is hardy at all ages, prolific, and lays on flesh rapidly, and it makes also a very excellent cross with the Dorking or Brahmapootra.

A very fair breeding stock for an ordinary-sized mixed farm would consist of one cock and twelve hens of each breed desired to be kept; the cock with six of the hens being confined to the respective yards, while the rest of the hens are left at liberty, and allowed to roam at large. One cock, with his own hens all duly marked for identification with tape or colored ribbon round one leg, may be let out every day for exercise, and carefully shut in again toward evening, the cocks taking their daily exercise in turns. All eggs laid by hens or pullets in the houses should be kept separate, either for setting, or for selling as pure eggs at a high price; while all eggs laid by hens outside the inclosed houses may be sold for table use, a few only being reserved for spring setting, that the chickens may be reared for the table, as crosses of the breeds we have indicated make first-rate table fowls.

Pullets should never be allowed to breed till they are eighteen months' old, and a cock is at his prime generally at between two and three years. To prevent "in-and-in breeding," which effectually ruins any yard in a very brief space of time, the cocks should be changed every second year; and great pains should be taken in selecting good, healthy, well-formed birds, with all the requisite "points" purely and distinctly marked. This remark applies to the selection of birds of both sexes, if it is contemplated to rear pullets or cockerels for exhibition and competition.

In feeding poultry, it must be borne in mind that in a wild state

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their food is very varied, and that it invariably comprehends worms or small insects, grains, and green vegetables, and hence all these varieties of food must be represented in their dietaries when under domestication or confinement, if they are to be expected to prove good either as table-fowls or as layers. If the plan we have recommended be adopted of allowing the different breeds to be at liberty on alternate days, to mix with the ordinary half-bred hens, and when they are not out, if they have access to a grass field or to newly ploughed land, they may be trusted in spring and autumn to pick up as many worms and eat as much grass as they require for general sustenance; and the food supplied to them at these seasons should consist of light grain, Indian corn, and balls made up of "sharps," or barley dust mixed with oat-meal, and moistened with hot water. During autumn and winter, when they can forage less for themselves, and when the weather is cold and less favorable to the laying of eggs, the diet of all fowls should be of a more stimulating character, and should consist of grain in the morning; potatoes boiled and mashed, and plentifully seasoned with ground Jamaica or black pepper for dinner; and of barley and oatmeal balls at night; and there should, besides, be always a cabbage stock or a few lettuce blades in their yards for them to pick at. It is further advisable to feed the fowls regularly at stated hours, and always within the houses, as when they are fed in the open air sparrows and other small birds help themselves to a large share of the food; and with the exception of the grain, everything they get should be put into their feeding troughs, and not thrown upon the ground, where it is trodden upon and wasted.

Young chickens should be fed every two hours for the first week, and while they are very young, hard-boiled eggs should be chopped small and given to them, and their drink may consist principally of skim-milk. Indeed, for all fowls either skim-milk or butter-milk will be found a very nutritious article of diet. Along with the minced eggs, little chickens may occasionally get crumbs of loaf bread and small pills of barley-dust and sharps, well moistened with milk, or any cold porridge or broth.

If a supply of eggs is desired during the winter months, and either very early or very late chickens for the market, it will be found profitable to have the houses heated with a stove. For this purpose, and where it may be inexpedient to erect a flue or chimney, if in the midst of a stackyard, or adjacent to a barn or other inflammable building, we recommend the use of the portable hot-water pipes pat-

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ented by Mussett (Winstanley Road, near Clapham Junction, London, S.), whose appliances are invaluable, economical, and decidedly indispensable for every breeding poultry-yard, or where young chickens are reared for early markets, and the accommodation of a fireplace cannot be obtained. By this process, for 50 shillings, an ordinary sized poultry-house is well heated, and without any building or other expense of that nature being incurred. It seems to us, indeed, wonderful that this apparatus, at once so portable, and so useful and efficacious, is not more generally used; and whether it be applied to the hatching or laying house of any poultry-yard, or for excluding the frost from any winter-frame, greenhouse, or foreing-pit, the one apparatus in any ordinary-sized place is very useful, being so portable and easily put in operation on very short notice. For the production of early chickens for market, which give a better return than later ones when the supply is generally abundant, it is also advisable to give the hens an abundant supply of hot, nourishing, and stimulating food; but, at the same time, it must be borne in mind that overfeeding frequently causes the hens to lay small eggs, and sometimes eggs without shells. To prevent the latter habit, hens should always have a little lime in their houses, or a supply of calcined or burned oyster-shells, well broken down, and scattered about their yards. In regard to the heating of those houses whence the chief winter egg-supply arises, and which will in general cases include the Brahmapootra yards, or those of the various varieties of the Cochin-China breed, we recommend the use of Mussett's patent portable hot-water apparatus, as before mentioned.

A few ducks will always be found useful and profitable in every farm poultry-yard. It is not at all necessary that there should be the presence of water, to insure successful and profitable rearing of ducks. In fact, it is the other way, and ducks invariably fatten better, and acquire earlier maturity and plumpness for the table, where they have no access to water at all. The breeds most adapted for successful rearing and use are the Aylesbury and Rouen; but in any situation, one breed is generally sufficient to keep, for in this way they can be allowed to be constantly at liberty. A small lean-to shed of wood, covered by felt, is all they require. It should be provided with a door and lock, to prevent them straying abroad. The ducks should be daily fed within their house, a process which not only prevents their acquiring the wandering habits to which they are naturally prone, but tends to economize food. It is best, in our opinion, to give the ducks and ducklings the run of the yard only

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after eleven o'clock A. M., for by that time most of them will have laid, and thus the eggs will not be lost, as so frequently happens. Like the "going-about" hens, the ducks on a farmyard require very little inspection, and little hand-feeding; but morning and evening they should get some mashed potatoes or turnips, mixed with barley-dust, and given in a soft condition.

Hens are generally employed to hatch ducks' eggs, but the ducks themselves will be found better for the purpose, as, if they are allowed to sit themselves, or are provided with a cool, damp nest, they will almost invariably bring out both a larger and a hardier brood than a hen. It is desirable to have as many early broods of ducklings as possible, as they command a ready market about the end of June and beginning of July; and, excepting for stock, ducks should never be kept till they are older than twelve weeks, if the maximum of profit at the minimum of cost is meant to be realized out of them.

It is almost impossible to calculate the real expense of breeding poultry on a farm of mixed husbandry, as the hens which are at liberty ought, in a great measure, to forage for, and keep themselves, and the food provided for those in confinement should consist chiefly of "light" grain, small or diseased potatoes, and refuse from turnips, boiled up with any offal from the farm-house kitchen; and we are convinced that fowls fed as we have described should not cost more for keep than two shillings per head annually. With regard to poultry kept in confinement, the case is different; and as the mode we have suggested, as most desirable for a mixed farm, is to keep a few fowls of pure breeds so inclosed, it is proper to state that, allowing these birds a fair diet, and stimulating food occasionally, to compensate for the want of exercise and natural food they would find for themselves, and assuming that their food must either be purchased at the ordinary market prices, or these rates be debited to the poultry department account for the quantity consumed, in the case of a farmer who feeds the yard from his own growth, the average cost of keep per head should not exceed six shillings per annum. Such an allowance will not only maintain the fowls in good health and profitable condition; but if a little linseed be added to the diet, with grated liver once a week, they will be in a state to exhibit or compete at any of the largest of our national shows, so far as plumage and condition are concerned.

We append an abstract of accounts and expenditure upon a yard so conducted, of which every article of diet, excepting the refuse from

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the house kitchen and garden, had to be purchased. These accounts are not chosen from any one individual "good" year for the sake of argument, but are the average of several years.

In France, where the management of poultry is far better understood (because more attended to) than in this country, the fowls are regularly every morning in spring conveyed in a covered cart to the fields where plowing is going on, and allowed to feed upon the worms, grubs and grass and other seeds which the plow turns up; and again in autumn they are taken similarly to the newly gathered stubble fields; and in this way they are almost wholly independent of any artificial feeding, and in a manner may be said "to work for their living."

In submitting the calculations given in this paper, we have purposely omitted fancy prices paid or received for prize birds and their eggs, as few farmers might be inclined to take the trouble requisite for obtaining them; and we have confined ourselves to showing how, with a very little trouble and additional care, and at almost no extra expense, poultry keeping may and ought to be profitably extended in any mixed farm in Scotland.

ABSTRACT OF ACCOUNTS REFERRED TO IN THE FOREGOING REPORT.

Poultry yard at Carlowrie. Season, 1866–'67.

No. 1—Brahmapootra yard, containing at 1st February, 1866, one cock and six hens.

Dr.	£.	s.	d.
To cost of one cock, at 25s	1	5	0
To cost of six pullets, at 10s. 6d	3	3	0
To cost of one year's keep of above on purchased food, at 6s. each	2	2	0
To share of cost of management, rent and maintenance, at 3s. per pair	0	10	6
	£7	0	6
To balance, being 40 per cent profit	2	16	0
	£9	16	6

Cr.	£.	s.	d.
By 65 eggs = 5 settings, sold at 10s. 6d	2	12	6
By 69 $\frac{7}{12}$ dozen eggs, at average market price, 10d	2	18	0
By value of manure	0	4	0
By value of feathers cast, at 6s. per stone	0	2	0
By value of seven fowls on hand at close of year	4	0	0
	£9	16	6

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Or, assuming that the eggs produced by this pure breed yard are hatched and not sent to market, we find the following result:

No. 3 yard—Dark Brahmas. Season 1866–'67, at 1st February, 1866, containing one cock and six hens.

Dr.	£.	*s.*	*d.*
To cost of one cock and six hens	4	10	0
To cost of one year's keep, at 6s. per head	2	2	0
To cost of share of management, rent and maintenance	0	10	6
	£7	2	6
To cost of four months' keep of 560 young chickens till sold, at 6s. per head per annum	56	0	0
	£63	2	6
To balance, being profit	35	19	0
	£99	1	6

Cr.	£.	*s.*	*d.*
By five settings eggs sold, at 10s. 6d	2	12	6
By 57 cockerels sold, at 5s. 6d	15	13	6
By 150 cockerels sold, at 2s	15	0	0
By 275 pullets sold, at 2s. 6d	34	7	6
By 78 pullets sold, at 6s	23	8	0
By value of manure, at 1½d. per head	3	10	0
By value of feathers, say	0	10	0
	£95	1	6
By value of seven fowls on hand	4	0	0
	£99	1	6

being a net yield, after paying all expenses, of about 57 per cent.

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ON DIPPING, POURING, AND SMEARING SHEEP.*

By N. P. Stewart, Cemaes, Llanerwst, North Wales.

The processes of dipping, pouring, and smearing, though entirely different in themselves, all tend to the same object, viz., the destruction of ticks and other parasites peculiar to sheep, enhancing the quantity and quality of the wool, and promoting the general health and comfort of the sheep. Each system has many advocates, but dipping appears to be the most universal.

Smearing is confined for the greater part to the highlands of Scotland, the upland districts of Lanark and Dumfries, and other hilly parts of the south of Scotland.

Pouring is pretty much discontinued now. It was practiced more extensively twelve or fifteen years ago, before dipping became so much in vogue. It is now mostly adopted by the smaller class of farmers, who grudge the expense of a regular dipping-machine.

We shall in the first place describe the *modus operandi* of each process, in the next place the ingredients used, and thereafter discuss the relative advantages of each system.

The simplest, and perhaps the most original mode of dipping is with the use of two large tubs; one for immersing the sheep in; and the other, having a close hurdle or piece of wire netting nailed over it, for pressing the liquid out of the fleece. This plan we have often adopted at hogg winterings and elsewhere, when better apparatus could not be conveniently had.

A tank, with a drainer attached, and constructed for the purpose, is, however, what is most generally used. The tank is made about five feet long, two feet broad, and four feet deep. The drainer is hooked to at one end of the tank. It is about four feet long, and composed of a lattice rack, resting on an inclined plane, which overlaps the tank, into which all the liquid pressed out of the wool returns. This apparatus costs £3, 3s., and five men can dip about 400 sheep a day with it.

* From the transactions of the Highland and Agricultural Society of Scotland.

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The crane and basket system is also much used. From a small crane two baskets are suspended by swivel chains. The sheep, having their feet secured, are placed within the baskets; and while one is being lowered and dipped, the other is raised from the tank and pressed. Three men can in this way accomplish as many as four with the tank and drainer; and this, we believe, is the only advantage.

A tank having dripping-pens attached is, however, the most modern, and decidedly the best apparatus. Two pens stand on an inclined plane ascending from the tank. These are generally constructed to hold twenty-five sheep in each. The tank leads up into either pen by a swing gate which shuts to either side; and while one pen is being filled up by the sheep as they pass through the tank, those in the other pen have had time to drip sufficiently to be allowed to escape by means of a gate at the back. The whole apparatus costs but £12, and every extensive flockmaster would do well to possess one; and once tried, we feel assured the outlay would not be grudged.

There is one desideratum, however, to which we would beg particular attention; that is, the shortness of the tanks as generally used, the majority not being more than five feet long. Every tank should be from ten to twelve feet in length, so as to allow two or three sheep, according to size, to be immersed at a time. This would exactly double or treble the amount of work done, and at the expense of only two extra men. With this description of tank four men could easily dip 1,500 sheep a day, allowing each sheep one full minute in the bath. The operation should never be hurriedly gone through, nor conducted in wet weather.

On mountain farms and exposed situations the use of oils in combination with the dip is now very generally adopted, and with much advantage. The common practice is to incorporate the oils with the dip by the use of soda or other alkalies. This course, however, is very objectionable. The reason is obvious. By rendering the oils soluble in water they become susceptible to the action of rain, which removes all that is soluble, and much of their value is therefore lost. With small flocks of a few hundred sheep, a good plan is first to dip in the usual way, and in course of a few days thereafter to pour with the oils. Rain can remove none of the oils so applied. This is rather a tedious process, however, and out of the question on larger farms.

We have had a good deal of correspondence with the Messrs. M'Dougall, Cooper, and others, as to the expediency of devising

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some means by which oils and greases could be incorporated in the water without *breaking* them, but without much result. A friend suggested to us the use of gum instead of soda. The effect of gum would be to *suspend* the oils in minute particles in the water. At first sight this appeared feasible; but on inquiry, we found that the price of gum, even at wholesale price, was such as to debar its use for all practical purposes, and, moreover, that its effect on the skin and porous system was the reverse of beneficial.

The plan we would recommend, and which we, in common with many of the most practical and intelligent sheep-owners in the country have adopted, is this: The bath is first made up to its proper strength, without any oils. It should always be kept in a lukewarm state, as it goes through the wool more easily, and is much more penetrating. The oils are slightly heated, and immediately before each sheep is immersed its proportion of oil is thrown into the tank, and readily adheres to the fleece in the course of dipping; and not having been rendered soluble, is retained in it.

In pouring there is but one process, which may be shortly told. The sheep is placed on a ribbed stool made for the purpose, the wool parted at distances of four to five inches apart, and the mixture poured in, small pots or vessels having spouts being used for the purpose. A man and boy should pour from seventy to eighty sheep a day.

Smearing is much more laborious, and consequently more expensive. It is done in pretty much the same way as pouring, only the wool is *shed* at distances of about two inches apart, and the smear applied with the fingers, care being taken that it is well laid to the skin. Twenty sheep per day is about the usual quota for one man.

We have now come to consider the materials used in those respective operations. In pouring and dipping these are generally identical, and need not, therefore, be treated of separately. The ingredients used are legion, comprising substances from the animal, vegetable, and mineral kingdoms.

When farmers compound their own baths, tobacco juice, spirits of tar, ground hellebore, arsenic, sulphur, soft soap, and soda are the articles commonly made use of; these, of course, in various proportions; some using more of one and others more of another. Tobacco juice, however, is generally made the *sheet anchor*. Soda is not, or at least *should* not be used, except for the purpose of combining oils and greases with the dip. The following we have always found a good and serviceable bath, viz.:

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8 lbs. tobacco juice (Fleming's or M'Ewen's).
6 lbs. ground hellebore.
4 lbs. soft soap.
½ lb. arsenic.

The hellebore, soap, and arsenic should be boiled well together in five gallons of water, the tobacco juice then added, and all poured into the tank, which should contain seventy-five gallons tepid water. This should suffice for 100 sheep, and costs about 1½d. each.

An infinite variety of proprietary and patent dips are now finding their way into the market. Some of these are really good, some indifferent, and others absolutely bad. Amongst those which occupy the first place are Cooper's, M'Dougall's, "The Glycerine," "The Tanfield," Bigg's, Rome's, Reid's, and Rawden's. These we may divide into two classes, viz., poisonous and non-poisonous. Of the former, Coopers's and Bigg's, in our opinion, stand first in order of merit; and of the latter, M'Dougall's and "The Glycerine." These are all first-class dips, and if the necessary instructions be attended to, will not fail to give satisfaction.

We believe Cooper's to be the longest established and cheapest, and also the most extensively used. As shown by the railway books, it appears no less than 1,200 dozen packages, or enough to dip 288,000 sheep, is sent out weekly. It is used extensively on the continent and in the colonies, accompanied by "directions for use," printed in many languages. As a summer and autumn dip, we consider it second to none, and have always used it. Its cheapness and extreme solubility in *cold* water particularly recommend it for these purposes.

Bigg's we have also tried, and found satisfactory. It is used extensively in the south of Scotland, and held in good repute.

Non-poisonous dips, however, we make our choice. If these are shown to be equally efficacious, why incur the risk of poisonous dips? M'Dougall's and "The Glycerine" are both dips of the first water, and of their efficacy there remains not a single doubt. The former we have extensively used for years, and can fully testify to its high order. Its essential basis we believe to be carbolic, tar, or creosote. The manner in which it kills is very peculiar, and different from any other. M'Dougall describes the tick as a "bag of albumen." His dip causes the albumen to become stiff, hence the tick dies. For improving the wool, and waterproofing the fleece, we think this dip stands unrivaled.

"The Glycerine" we have also had the pleasure of trying, and like very much. "The basis of this composition is the solution by

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glycerine of the lighter oils, distilled from peculiar Scotch coals. The action of these light oils is identical with the action of benzine; and if you take a sheep tick or an acarus, and try to kill it with benzine, you will find instantaneous death caused; whereas in solutions poisonous to man, and the higher order of animals, the same parasites, and particularly the acari, live many minutes." "The Glycerine" gives the wool a very pretty appearance, and a peculiar soft and silky feel. We believe it bids fair to be more heard of by-and-bye.

We know some well educated and thoroughly clever farmers who fancy a blending together of a poisonous and non-poisonous dip (M'Dougall's and Bigg's being generally selected) is better than any one of these alone. This, however, is pure sophistry. The active principles involved in the contact of a poisonous and non-poisonous dip tend very much to neutralize the effect of both; besides, the mixture would not contain enough of M'Dougall's to kill in its own peculiar way, nor enough of Bigg's to poison. Failure would, therefore, be the inevitable result.

Of oils for dipping purposes, the finer qualities of Gallipoli, olive, and castor, are all suitable. Great care, however, should be exercised in the selection of these oils, as the coarser qualities sadly discolor the finer wools. For blackfaced sheep whale oil and whale oil foots are sometimes used. A very little pine oil (rectified) is also useful, to fix the other oils in the fleece.

This year we have used an entirely new oil. It is manufactured by the Messrs. Anderson & Wallach, Abercorn oil works, Paisley. They have just introduced it, and call it "wool oil." It is manufactured by distillation, and represented to have all the properties for dipping of the best olive oil. The price is £38 per ton, or 2s. 9d. per gallon. We have just done using it, and like the appearance and feel it imparts to the wool, and think it will answer admirably.

For smearing purposes, the variety of materials used is comparatively limited. They may be briefly enumerated thus: Tar, butter, American grease, brown grease, palm oil, and "The Tanfield White Smear." There are two kinds of tar, viz., American and Archangel. The former is more resinous, but contains less turpentine than the latter; it is therefore milder, and chiefly used for Cheviot flocks. The use of Archangel is generally confined to blackfaced sheep; the casks are of four different brands. For smearing purposes Nos. 2 and 3 are the most suitable. No. 1 is too thin, contains too much turpentine, and useless toned down by the addition of an extra quantity of butter or oil, is apt to kill the sheep. Tar of this description is extremely

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detrimental, and often entails serious loss. No. 4, on the other hand, is too thick and pitchy. In butter there is a greater variety—Siberian, Irish, Australian, and American being the chief. The first three are pretty much on par. American is inferior, and much cheaper. There are two qualities of American grease, and three of brown grease. The latter we understand to be nothing more or less than the suds or scourings of smeared wool, distilled and purified, of course. Palm oil is little used, and the less the better. In making up a "tub," eight pints of tar to twenty-five pounds of butter is the general rule. A quart of oil added would be an improvement. When greases are used instead of butter, the quantity requires to be more; say of American grease thirty pounds, and of brown grease thirty-five pounds. The latter, however, we should not recommend to be used by itself. With butter in equal parts it does very well; but when used alone, the wool can be readily distinguished, being brittle, dry and crispy, and of course less valuable. Of Mr. Girdwood's "Tanfield White Smear" we have no personal experience, and can scarcely therefore hazard an opinion.

We have now come to consider "the relative advantages of each system." In doing so, much has to be considered, such as climate, situation, elevation, etc. If public opinion, or rather the extent to which any one system is practiced more than another, can be any criterion of its usefulness, then undoubtedly dipping must bear the palm. In every county in the United Kingdom it is practiced to some extent, and its popularity we think is not undeserved. It has almost entirely superseded pouring, being not only cheaper and more expeditious, but in our opinion more effectual. Shedding the wool in pouring is very objectionable. Summer dipping has much to recommend it. On many low-lying farms, subject to maggot, etc., dipping after clipping is now looked upon quite as a matter of course. For lambs, too, at weaning time, it is almost indispensable. It promotes the growth of the wool to a wonderful degree, and allows the animal to graze in quietness and comfort, unmolested by ticks or other vermin. It is also a notable fact that sheep feed much more rapidly after having been dipped. This system has, as we have already remarked, not only greatly superseded pouring, but goes further, and is now to a great extent substituting smearing. For this purpose the regular dip is supplemented by a generous combination of oils or greases. These tend pretty much to waterproof the fleece, and afford somewhat of the protection of tar and butter. This medium course is now very generally adopted in the south of Scotland, and many

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parts of Inverness, Perth, and Argyle, and gives universal satisfaction. Although, in a general way, we are inclined to advocate dipping, yet in many parts of the country it would be folly to ignore the superiority of the good old rule of tar and butter. On the Grampian and Monalia ranges, and the highest parts of Ross and Argyle, we consider smearing the perfection of good management.

On such exposed situations, protection and shelter to the sheep is quite equivalent, if not paramount, to its feeding. For the last few years, too, a comparison of the prices of laid and white wools will be found to be in favor of the former. In drawing such a comparison, the relative weights of those wools must be taken into account. It is generally reckoned, that if white wool does not yield one-third more in price than laid wool of the same description, the latter is the more profitable; and the margin at present between those two classes of wool is less than we have ever known it before. White Highland, in particular, has been rather at a discount for a few years back, and complaints are common with manufacturers as to its increasing kempiness and want of lustre. These complaints, we fear, are not without some reason, and may, in a great measure, be attributed to the too general use of mineral poisons, arsenical dips, and dips of caustic properties, which only tend to destroy the natural yolk of the wool, and render it brittle, light and dry. Such dips are most obnoxious, and cannot be too strongly deprecated. If in addition to any good dip, oils were liberally applied, as already indicated, we feel assured much of the kemp and dead hairs complained of would be obviated. We fully concur with Mr. Hope Vere when he says, the dip should be sufficiently strong with oil or grease to repel any approach of moisture, and to promote the secretions artificially when the natural secretions fail. A more generous dip would keep up the character of our white Highland. We may mention, by way of parenthesis, that Welsh wool is even more kempy than white Highland. So much, however, has three years' treatment, as prescribed, improved its quality, fibre, and appearance, on our farm, that lately we had a parcel sold by Mr. Girdwood of Edinburgh, at 1s. per pound; and we are not aware of any other clip in the principality having fetched more than 9½d. per pound. Nor is it quality alone, but weight and quantity as well, that oils improve. Mr. Pagan of Invergeldie, one of the largest sheep-owners in Perthshire, uses oils on an extensive scale; his experience should, therefore, be allowed as good authority; and he has assured us that the *weight* of his clip now is nearly equal to what it formerly was when smeared with tar and butter. He dips

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with M'Dougall's and Bigg's in equal parts, to which he adds the finest castor oil, one and one-fourth gallon to every twenty sheep.

There are other advantages, however, which we claim for dipping, and which we shall now proceed to speak of. In the first place, its economy recommends it. Our dip for this year; two gallons wool oil per twenty sheep, appended to M'Dougall's, costs exactly 3d. per head; whereas smearing with tar and butter, or best greases, costs nearly three times as much. A saving of nearly 6d. each is thus affected, which, in the aggregate, on several thousand sheep, forms no mean item.

Again, the *time* employed in these respective operations should not be lightly passed over. A stock of 5,000 sheep could easily, with a good apparatus, be dipped in four days; whereas the smearing of that number, with say ten men at work, would occupy as many weeks. Smearing is a most slow and tedious process, and during the whole time it drags its length along the amount of tank-work, the amount of dog-work, and the amount of driving to and fro of sheep, generally through the best of the wintering, trampling down the grass, are facts patent to every Highland farmer; and though not perhaps quite so palpable as others in the shape of pounds, shillings and pence, yet cannot be ignored.

In the last place, though not the least, it is rather a noteworthy fact, that white ewes, *i. e.* dipped or poured, keep their lambs better than laid ewes. Till making the experiment for ourselves, we must say we felt rather skeptical on this score. We tried it on the farm of Beallid, near Kingussie, in 1861. The ewe stock was 2,000, 1,000 of which we laid with tar and butter, and 1,000 poured with

8 lbs. tobacco juice,
6 " hellebore,
4 " soft soap,
½ " arsenic,
} for 100 sheep.

All grazed indiscriminately over the farm.

It was a bad winter and worse spring; lambs were, therefore, rather a short crop, and as follows:

Poured ewes, 782 lambs,
Laid " 702 "

80 at say 10s. = £40, in favor of white ewes. This sum, however, would scarcely compensate for the loss of wool in the white ewes over those laid. The former were much more ragged; but we should, of course, mention that a dense cover, with large quantities of matted underwood, existed on the farm, and

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white wool seemed much more susceptible to be ripped and torn off; but the question even as to wool is open to doubt. In this instance, no oils were used; had there been, we feel assured they would have altered the matter.

The result of our experiment, however, went clearly to demonstrate that white ewes invariably yield the largest crop of lambs. The reason why, we must confess, has always remained an enigma to us.

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DUTIES OF THE VETERINARY SURGEON IN THE EXAMINATION OF HORSES AS TO SOUNDNESS.*

By George Armatage, M. R. C. V. S., Linslade, Leighton Buzzard, Beds.

The experience and difficulties that always attend those in search of a horse are acknowledged to be great (the latter have been decided as insurmountable), and many have largely expatiated upon the question. The decision of a veterinary surgeon being occasionally, and in some districts frequently, demanded, in order to bring about more facile means and favorable conditions, has stamped that department of daily routine which takes cognizance of the defects of horses with as grave importance as any that falls beneath the practitioner's notice.

The benefits to be derived are manifold and mutual. It may be said they hinge greatly upon the qualifications and judgment of the veterinary surgeon, and his mode of conducting the inquiry. When the latter are of the required order, he obtains increase of reputation and emolument; his discrimination in the matter gives him an authority that merits the approval of his clients, and has weight in the elucidation of points upon which a line of correct practice may be based.

The public participate to an extent, which, it is to be feared, is but slightly understood and appreciated, judging from the numerous transactions in horses that occur daily without professional advice, and the misunderstandings that attend the major portion. To the non-professional part of the community, the examination of horses is a most useful proceeding when properly conducted, as its members experience confidence and satisfaction that judgment superior to their own enables them to select a suitable animal, or reject a worthless, if not dangerous "screw;" and lastly, by proper and well-timed advice, many useless and vexatious disputes, which profit no one but the lawyer, are avoided altogether.

The object for which examinations of horses are instituted is the

* From the transactions of the Highland and Agricultural Society of Scotland.

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detection of malformations, blindness, lameness, organic and other diseases that may endanger the health or life of the animal, or otherwise betray him to be unsaleable, and an unsound commodity. The principle also fulfills another equally important end. As there are many defects that obtain in different animals, but in no way interfere with the general health, aptitude or condition, by examination we are enabled to point out and separate these from others more particular and severe in their nature. It is thus we may establish a line whereby some animals may be estimated in the light of soundness for all essential purposes, while they would not bear an investigation in a court of law. Throughout the practice of the writer, he has been in the constant habit of regarding animals brought for examination, and having defects, under two aspects: one, as far as general utility and endurance is concerned, sound; but which, under a legal aspect, would be decidedly unsound.

As animals are regarded by law, *all* defects, whether they be abnormal growths of no detriment whatever—in fact, anything unnatural as the result of disease or development, although obstructing neither locomotion nor organic functions, is decidedly an unsoundness. There can be no question as to the legal interpretation of the word "soundness." It really means what it expresses. All animals disposed of under the stipulation are expected to be free from blemish of any sort, outwardly and inwardly, with no reservation as to kind, size, or character. The heart, lungs, brain, in fact all organs and parts, must be perfect. Symmetry is not demanded, as soundness exists in ugliness as well as beauty of the animal.

Seeing the conditions that are enforced by law under the term soundness, the veterinary practitioner may fulfill an important duty by pointing out their nature to those seeking horses. Many more useful and lasting animals might be secured than are at present, under a mistaken sense of opportunities, and purchasers also prevented from "going further to fare worse," as is frequently done. Examinations might become a greater institution, and be the means of deciding profitably more cases without legal aid and expenses than all the quibbles resulting from purchase under warranty. In Ireland the practice at fairs and markets, etc., consists of a customary agreement between buyer and seller, which decides that the transfer of the animal shall be made or not, in accordance with the decision of a veterinary surgeon. Both go in company—taking the horse—state their request, ask the fee, each placing the sum in the hands of the examiner, when the investigation proceeds. It must here be under-

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stood the veterinary surgeon recognizes neither purchaser nor seller, and his judgment is therefore expected to be strictly *impartial.* At length, the scrutiny is concluded, when, if the horse is declared unsound, the intending purchaser receives back his fee; if otherwise, he takes the horse, and the seller receives back his fee. The practice, which has much to recommend it, is said to work well, and litigation upon a question of soundness in horses to be seldom heard of.

Upon the continent, where horses are sold as in England with a warranty, the maladies to which they are subject are separated and placed under two different heads, viz., common or ordinary diseases, and *redhibitory* defects. Among the former are conditions that are known to possess well-defined evidences, palpable at the time of sale; with the latter a given time is allowed to each, in order to admit of their appearance after purchase. In reference to many occult diseases, the practice answers admirably. Much of the hard swearing that characterises British horse cases is thus avoided, technical objections being taken in accordance with the known variations, duration, and effects of the disease in question.

In the examination of horses as to soundness, the veterinary surgeon resorts to various tests by which the condition of the animal is ascertained. These are of two kinds. The first consists of minutely examining *all* the points of the animal, during rest and action, with the view of detecting visible deformities and defects, as alteration of size or structure of parts, as well as irregularities in action arising therefrom, which may be denominated lameness, etc. The second test is a process of manipulation. This is made use of in order to confirm already observed appearances of irregularity, while others not hitherto visible are detected. Local pressure, flexion, extension, etc., are the means employed.

The length of time required to test a horse properly depends upon various circumstances. It is not advisable to proceed to a *general* examination immediately after a journey or rapid exercise. The veterinary surgeon should *always* have free and uninterrupted opportunity to carry out his inquiry. It is also good practice for the examiner to ask, when a horse is presented for scrutiny, whether a general and complete examination is required, or whether an opinion is wanted on the state of some particular part or limb that has already been questioned. There need be no precise statement that the animal has been condemned for a spavin, splint, or broken wind; but the examiner may be informed that his attention is to be particularly or solely directed to such a limb, the organs of respira-

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tion, etc., as the case may be. The practice would do away with a needless waste of time, and serve to concentrate the attention, and employment of special tests if required, more effectually than might occur if an opposite method is adopted.

Certificates of Soundness.—From the results of experience, the writer believes it to be the duty of veterinary practitioners to avoid as much as possible the granting of certificates of soundness for horses passed by them. There is no obvious good arising from a written statement of the soundness of an animal, if a purchaser agrees to take him when such can be declared. Nor can greater safety be derived by either side, if he is decided to be unsound, by the mere granting of a certificate. Two persons only are interested, between whom it should be previously agreed that purchase depends upon soundness, declared by a veterinary surgeon. No *written* statement can then be required, as purchaser and seller have gained what they sought for; such a decision, whether verbal or written, applies to the time at which the animal was under examination, and is clearly available at no other. In a few days, or it may be a few hours, the animal is no longer able to answer to the description and judgment given verbally or in the certificate; yet how often has a sale been sought to be fraudulently effected on the terms of the previous decision, particularly if it has been conveyed by sign manual? A pony was lately examined by the writer, and declared to be sound, when the purchaser requested the opinion to be expressed in writing, in the form of a certificate. In vain it was urged that such a document would be of no service, as the animal had become his property by virtue of the decision, and in accordance with previous agreement. Still he persisted, adding: "I may require to dispose of the pony after a few months, and would then require the certificate."

It is the practice of some dealers to use a form of certificate having no date, referring to a "black" or "bay horse," etc., as the case may be, which is of course pronounced sound. The voucher is caused to do duty many times, as it will apply to *any* bay or black horse, no age or marks of identification being mentioned.

Whenever horses are sent from a distance, and certificates of soundness are absolutely required, the animal should be fairly described, the height and age, with the date, being included. Next should follow the *opinion* of the examiner as to soundness, to which his signature and full qualifications are attached. In a footnote or postscript, the means by which the animal is to be identified in future—such as

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peculiarities of shape, white places, deformities, etc., if any, are stated. A counterfoil also contains the same particulars, in an abbreviated form, for reference at a future time. Neglect of these precautions has been known to admit of a horse being presented a second time to the same examiner, after various arts had been practiced for disfigurement, when the previous unfavorable decision was reversed, and a certificate of soundness granted.

Defects in horses sought for in an examination by the Veterinary Surgeon, the means adopted to ascertain their existence, and amount of interference with the animal economy.—There cannot possibly exist the shadow of question that the sciences of anatomy and physiology are material aids to the judgment of the veterinary examiner of horses as to soundness. They secure more than half the means toward an accurate conclusion, as so much depends upon an intimate acquaintance with the natural and healthy conformation of different animals. Without due regard to these, sad mistakes have occurred. The prominent bony processes, peculiar to the hock of "the thorough-bred," have been pronounced as spavin, and the condyles of the *os suffraginis*, pastern bone, as ring-bones. Conceit and positive envy, as well as ignorance, have often much to do with such decisions, in which it is feared the animal and the public derive but faint benefit. A series of such unpleasant cases came before the writer recently. An unfortunate member, who ignores scientific teaching and everything but self, was called in to attend one horse out of several that were lame. All but that to which his attention was directed were, as he well knew, under the care of the writer, having been examined, and found to be suffering from punctures by nails in shoeing. Unasked for interference, however, was persisted in; each animal was examined by him, and declared to be lame from different causes altogether. One was said to have "a cracked pelvis," for which slaughter was recommended; a second was pronouced "lame from ring-bones," and the request made that he might fire and blister the animal on a certain day; and the third "had a sprained tendon." The owner refused to comply with the requests, and the treatment already adopted was continued with the anticipated results, the formation of matter (pus) within the feet in each case. Relief was gained in a few days, the animals went to work, and were continuing sound some months afterward.

A sound acquaintance with the departments already named will prepare the eye, which, by repeated trials and comparison of different animals, in the end, becomes most effective in an almost instantaneous

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detection of visible abnormal states. They are the key to rational practice, and become powerful levers to the appreciating veterinarian, which are peculiarly manifest to himself in his preliminary scrutiny, as well as subsequent manipulative process for confirmation. Such a man needs not to hesitate upon ordinary conditions, nor to "stroke down" repeatedly the limb, as uncertainty of decision and opinion would warrant in young and inexperienced practitioners. Much of this is dissipated by the knowledge in question, hence the great reason why the student should receive careful instruction in it.

When a horse is submitted to a veterinary surgeon for examination, it is a good plan to visit the animal in the stable after he has been resting some time, that any particular mode of standing or position of the limbs may be noticed. The respiration also may be observed; and if a small quantity of food is given, it may be proved whether he is a "wind-sucker" or not.

He is next turned round, the saddle or clothing being removed, and led by the bridle to the outside in full daylight. A groom holds him in such a manner that all the limbs are placed in a natural and regular position, and the examiner, beginning in front, commences a careful survey of the whole animal. The head, neck, chest and fore-legs being observed from before, the neck, withers, fore-limb, ribs, flank, haunches, hind-limb, abdomen, groin, tail, etc., are successively scrutinized from the near side, as the examiner passes slowly backward. This done, he steps behind, when the hind-limbs, haunches, etc., are observed. The right side is next examined forward, the search terminating at the head.

It is during this preliminary survey that spavins, splints and many defects are found before the animal is touched, and justified by subsequent manipulation. The late Professor Dick placed great faith in this preliminary test, and wisely sought to impress his students with its importance. It is possible that the major portion of his success as an examiner of horses was due to the keenness and precision with which that portion of the duty was carried out.

The examiner now again stations himself in front of the animal, and passing the hands over the face from the ears downward, defects or injuries peculiar to the part, or their evidences of having been present, may be detected. These are scalp wounds, slit or paralyzed ears, perforated sinuses, etc. The eyes are next looked at. Inequalities of size, paralysis of the iris-amaurosis or gutta serena, glaucoma, cataract, injuries to the orbital arch or palpebræ (eyelids), and impervious lachrymal duct, may be looked for. In the lower part of the

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face, fractures or disease of the frontal, nasal and maxillary bones, paralysis, or abnormal action of the nostrils, and the evidence of polypi, bony tumors, chronic discharges,* and other irregularities, may exist. Besides, it is necessary to notice whether white stars, stripes, or a "blaze" have been dyed,† or the hollows above the eyes inflated with air, in order to raise the skin, and obliterate the appearance of age. Stains from colored solutions seldom produce the requisite shade. A wet sponge, in many cases, will remove them, except when certain metallic solutions have been employed. But even then the presence of the agent may be demonstrated by chemical tests, which proceeding might be required on certain occasions. When air has been blown beneath the skin, a crackling sound is emitted when the hand is passed over. Such a fraud is termed "puffing the glym."

Descending to the mouth, the examiner directs his attention to the lips; they may be paralyzed. The teeth are noticed next, and the correct age determined. At the same time will be observed whether any have been prematurely extracted, or worn in the habit of wind-sucking.‡ The infundibulæ or hollows are sometimes disfigured, cut deeper, etc., a trick called "bishopping," in order to produce the marks of youth, and cause old animals to pass away more readily.

The tongue is sometimes injured by the bit, or partially lost by strangulation. Its presence should always be ascertained, as with only a portion the animal is not only unsound, but frequently a great nuisance. The powers of prehension and mastication are then considerably interfered with, and by these means condition and ability are quickly sacrificed. The under jaws claim attention, as fractures occur across the body, when bony enlargements are to be observed, as well as more or less alteration of shape, and inability to close the lower incisors upon those of the upper jaw. Between the branches enlarged or indurated glands, the evidences of chronic nasal, and other diseases, are to be sought for. Indurations also, as from setons, may be found, and proved by collateral facts to be connected with chronic laryngeal disease, previously opened lachrymal duct, or damaged submaxillary artery.

The examiner has now arrived at the near side of the animal, and

* The interior of the nostrils should always be examined. Although glanders may not be suspected, it is possible, in certain cases, that tow or sponge may have been pressed up the passage to arrest, temporarily, chronic discharges. It is a common practice with low dealers, who call such an animal "a captain."

† A process called "gypping."

‡ In some establishments stone mangers are made use of, and the writer has noticed the incisor teeth have been worn very much, but in a more parallel direction to the length of the tooth. "Crib-biters" or "wind-suckers" wear their teeth on the grinding surface, as well as in front.

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then passes his hand to the poll, between the ears, turning the mane on one side in so doing, in order to discover any thickening or signs of the previous existence of *poll evil*. If the nose is held forward, and stiffness of the head and neck apparent, the animal should be further tested by putting him through evolutions for the purpose at a later period. Signs of surgical treatment should also be looked for, which are usually unmistakable in the loss of hair, cicatrices, etc.

Enlargement of the Parotid Glands is seen from the same position. Situated as they are at the angle of the jaw, covering internal vascular parts, and being very vascular themselves, they are known to participate in inflammation, which seizes the former. From this cause enlargement appears after repeated attacks, and is sometimes associated with "roaring," and discharges from the "guttural pouches" *via* the nostrils, which prove tedious and depreciating.

Impervious Jugular Veins.—The condition of these vessels is ascertained by passing the tips of the fingers slowly down their course, applying tolerable pressure. The effect is to arrest more or less the flow of blood and distend the vessel. If a tilting action is now executed, the competency of the vein will be demonstrated by the effect becoming visible throughout the course above the fingers to the angle of the jaw. Failure in producing these signs must be accounted for in the loss of the vein.* Since, however, phlebotomy is now less resorted to, impervious jugular veins are not common. Horses so affected are incapable of grazing. By reason of the deficient means for the return of blood from the head, swelling occurs, which in some instances may be attended with fatal consequences; besides, such animals are even unable to work with a collar unless it be very large, to avoid pressure on the remaining jugular vein or anastomosing and vicarious branches.

Venous Pulse.—This is invariably looked upon as a symptom of disease of the lungs or heart. It may, however, be seen when such conditions are present, or even any other disease. A full stomach, by pressing upon the lungs and obstructing the flow of blood through them, naturally retards the circulation from the right side of the heart; the result is then the venous pulse, or an obstructed descent of blood along the jugular vein, and the characteristic appearance which similates regurgitation. The tricuspid valves, also, are not so perfect in their closure as those of the left side, a circumstance which, in conjunction with that already named, favors the phenom-

* Animals having thick, short necks require a strict examination, as the vein lies deeper, and is not so readily demonstrated.

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enon. When it is observed, however, the practitioner should extend his examination to other parts, in order to possess correct information. These will be noticed as we proceed.

Stricture of the Œsophagus, or *Saccalous dilatation*, with fractures of the windpipe, and signs of the operation of tracheotomy having been performed, should be sought for at this stage.

Fistulous, or Deformed, Withers.—The hand is carefully passed over these parts during an examination, in order to prove their freedom from disease. In consequence of badly-fitting collars or saddles, unequal pressure produces inflammation within the parts, which, possessing so much fascia, causes the action to partake of chronic characters. Wounds, the result of abscesses, appear, and sinuses, from the burrowing of matter, penetrate the muscles and tissues beneath, reaching even the shoulder blade, and under it, the elbow, point of the shoulder, or pectoral muscles in front of the chest. In other cases, the bones of the vertebræ are involved, and long-standing sores are the consequence. After they are healed, the usual indications are loss of hair and substance, giving rise to deformity and considerable depressions, cicatrices, and, it may be, altered action.

Shoulder-Slip.—The shoulder blade, *scapula*, and *humerus*, are maintained in their position by muscles, one ligament, and atmospheric pressure. Severe exertion may cause such an extension of these muscles that their fibres are lacerated, but no dislocation occurs, as is sometimes stated. From a careful examination of the structures that enter into the composition of the joint, it will be observed that when dislocation takes place the animal must be forever afterward useless. But in shoulder-slip there is a want of controlling power over the bones, which, during progression, roll outward, from which circumstance the term shoulder-slip has been taken, Chronic stages are evidenced by wasting of the abductor and spinati muscles, with a loose and slovenly movement.

Capped Elbow will be sought for next in order. Although it is not a condition that is likely to interfere with the usefulness of the animal, yet he cannot be pronounced legally sound. The tumor admits of removal, and horses may be safely passed with the special allusion, if there is faith that the purchaser will observe preventive means after the operation, such as causing the animal to wear a pad when at rest, and abandon calkins on the heels of the shoes.

Broken Knees.—In passing the hand down the arm, the presence of wounds, cicatrices, etc., is to be noted and estimated at a subsequent period with the movement of the limb in progression. At the

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knees, wounds, loss of hair, with cicatrices or thickening, may appear. Sometimes these are done by striking the manger, and the animal is accused of being "in the habit of saying his prayers," in horsey phraseology. A mare, once in the writer's possession, injured her knee by scraping or pawing impatiently when the groom was feeding the others. In the corners of the stall occupied by her were stone troughs or mangers, and it was against the sharp edge of one of these that the knee was struck with considerable violence. Many persons condemned the mare as having "been down." This was, however, incorrect. The accident was observed at the time, and proper treatment carried out, which resulted in the formation of a cicatrice, at least a couple of inches above the part always struck in falling. This is by no means an isolated instance, many of the kind having occurred, and we conclude therefrom that horses must not always be accused of having fallen down because a wound or cicatrix is discovered on the knee. The judgment must be formed in accordance with the situation of the mark. In ordinary falling down the damage is mostly confined to the *lower row of bones* and head of the *os metacarpi magnus*, or cannon bone, but injuries from adventitious sources are frequently higher. Repeated blows and injuries from falling down produce thickening of the skin and enlargement of bones, and, proportionately, an amount of stiffness and pain, which is evident on flexion and extension. Any suspicion of the existence of these must be confirmed by raising the foot and flexing, bending the lower part of the leg upon the arm behind.

Splints are ossific enlargements upon the inner side of the cannon bone. They are the result of inflammation, and not unfrequently produce severe lameness. A decision in all cases of legal question would be one of unsoundness; but judgment as to the passing of the horse, with special reservations, will materially depend upon the situation of the deposit and the amount of interference it effects upon the mobility of the parts. A splint "low down," or, in other words, situated midway upon the cannon bone, may prove no inconvenience; but one in close proximity to the knee may be harassing and perplexing. Splints should always be detected in the preliminary survey, and confirmed by the test of manipulation.

Enlarged or Thickened Tendons, Knuckling, etc.—Sprains of the flexor tendons or back sinews are common, and may be detected as the animal stands; but the most certain test is by passing the hand down them in both legs. In the recent state swellings are demonstrable, and are hot and painful; in the chronic stages they are knotty,

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hard, well-defined, but generally insensible. Constant shaking upon the road, overwork, etc., besides producing inflammation of the joints, with limitation of movement, also affect the tendons and ligaments. Their fibers are more or less lacerated, and the inflammation set up not only produces the enlargements referred to, but also contraction or shortening of their fibres. The leg then assumes a bent appearance, the knee being considerably advanced, a condition usually known as "knuckling." Considerable disease of the articulations, and thecæ of tendons, is also frequently present conjointly, and the animal is tottering and unsafe. No animal, even in the simplest stages of these affections, can be termed sound, but depending upon extent of the injury and employment to which he is to be subjected, a transfer may be advised, and the same prove profitable. The practitioner, however, must have confidence in his employer under the circumstances, or nought but extreme mortification may result.

Breaking-down consists of complete rupture of the tendons, and forbids that any animal should be allowed to pass without the conditions being fully pointed out to the intending purchaser. Some animals, having suffered from injury of this kind, may exhibit a presentable appearance to the uninitiated, but are totally incapable of enduring even moderate exertion. There may, however, be reasons, if the animal is a mare or entire horse, why it should be purchased; otherwise no advice can be justly given that will induce any person to bear the annoyance of the creature in an attempt at being workably useful.

Ring-bones are deposits of ossific material round the pastern and coronet bones. *Side-bones* are ossification of the lateral cartilages, and are frequently visible to the eye, as well as being demonstrable to the touch. Both are the result of concussion, engendering inflammation and ossific deposit, which interferes with the action of the parts, and gives rise to clumsy motion, and pain and lameness in many instances. Although such animals are unsound, even when lameness is not present, yet there are instances in which a transfer may take place on special terms, the defects being admitted. Many useful animals, continuing free from lameness a long period, may be found having both these defects, and proving amply remunerative when properly worked and cared for.

Navicularthritis.—This is an incurable affection usually known as "groggy lameness," located in the navicular joint of the fore feet. It has not been known to affect the hind feet, except in rare instances. The hoof becomes elongated from above downward, as well as from

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the heels forward, the horn strong, and frog shrivelled and small. The toe is much worn in the first act of progression, and pain is usually evinced when pressure is applied by the thumb, upon the tendon in the hollow of the heels. Lameness, with more or less "stilty action," is also apparent. During rest the foot is placed in advance of the body, and pain is evinced by the constant but careful pawing in which the sufferer persists. In some instances the foot is little altered in shape, and even remains so after the acute symptoms have set in. The alteration of the hoof depends upon internal changes, and is an ulterior sign altogether. Other cases show all the deformity peculiar to the affection, but *no* lameness exists. If the coronet is punctured severely with a needle no sensation is manifest. The animal has been subjected to the operation of neurotomy (division of the nerves), and cicatrices will be found on their course, either above the fetlock or immediately below it. When the disease is confined to one foot only, such an animal proves a profitable investment for low dealers. They remove the shoe of the *opposite* foot, pare the sole thin near the toe, place a flat pebble on the part, and afterward nail on the shoe, taking care that pressure is exerted upon the sensitive parts by means of the shoe upon the pebble. This operation is termed "beaning," and has the effect of preventing that inequality of action which characterizes severe lameness in one foot. Pain thus induced in the sound limb causes the animal to halt less upon it. The action is then rendered more uniform in both.

Corns.—The seat of corn is usually in that part of the sole comprised between the crust or wall and its inflection, called the bars. In obedience to the laws of gravity, they are mostly confined to the "inside heel." There are, however, numerous instances in which the outer are affected. Whenever corns are present the purchaser should be apprised of the fact, but it may not always be allowed to weigh against purchase.

Corns may be but slight and transient in nature. Their appearance in the sole is an evidence of a subsequent stage and of the damage inflicted. The causes are local pressure, chiefly from careless shoeing, and too frequent, as well as unlimited use of the knife. In slight cases proper shoeing may succeed in reducing their character, and even cause them to disappear. On the other hand, when they have existed for some time, and deformity of the hoof has taken place, although no lameness exists, the animal must be viewed with great suspicion. Tumours of horn develope within the hoof and invade the sensitive structures, causing absorption of the coffin bone and pro-

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tracted lameness, defective secretion of horn, etc., which becomes highly aggravated by work, particularly when it is of a fast kind.

In all cases of examination as to soundness, and particularly where suspicion exists as to the presence of disease within the feet, the shoes should be removed and a careful examination instituted. This does not essentially consist in paring away horn from every part of the hoof. Sufficient is effected if the soiled parts are removed so as to expose the fresh growth. Percussion and pressure will then materially aid the search. The presence of corns, pebbles, etc., may be readily demonstrated by means of the ordinary "searcher," when no smith is at hand, and such an examination may, in numerous instances, answer every purpose.

It is a common practice to test the amount of inflammation existing in the feet by the application of cold water to the hoof, and noting the rapidity of evaporation. That which dries the quickest is looked upon as participating in the abnormal process. At the best it is an indifferent test, and liable to great variation and deception. The local as well as general use of the thermometer can only be relied upon in such cases; an additional test of the condition of matters may sometimes be gained by an examination of the hollow of the heels. Cicatrices, indicative of the previous use of setons through the frog, are likely to be found; but they must not be confounded with the indurations left as a result of severe and frequent cracks in the heels.

Sand-cracks.—These troublesome conditions are sometimes present at the time of purchase, and from which the animal is decidedly unsound. Old-standing affections are to be viewed with suspicion; but if the crack be of recent origin, no lameness present, and the creature young, having had no such disease previously, a purchase may be effected. The writer has, in numerous instances, advised such a proceeding, with the most happy results, proper domestic care and medical treatment causing the foot to remain sound throughout years, if not the whole of the life of the animal. Care is required to ascertain the first cause. Feet that have been reduced too much, and subjected to alternate drought and moisture, prove liable to sand-cracks. Proper management, however, removes the deteriorating influences, and the disease disappears. The feet of chestnut horses, particularly those that are tall, and having white heels and coronets, are generally possessed of only a weak power of reproduction. The horn is thin, shelly and brittle, and sand-cracks of a most difficult kind occur in them; sometimes the feet are soft, denominated fleshy, when the

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carriage of shoes is rendered an awkward affair, and, in some instances, impossible for a time. If these characters are thoroughly demonstrated and explained, a proper decision may avoid much expense, trouble, and vexation.

Seedy-toe consists in a separation of the outer fibers of the wall of the hoof from the inner or laminal portion. In fully established cases the cavity enlarges as it approaches the ground surface, and is filled with or contains a great quantity of grey powder, the result of an imperfect secretion and elaboration of structure at the coronet. In the experience of the writer, seedy-toe has occurred most frequently among the heavier breeds of horses, as a result, probably, of injuries inflicted above. In slight cases, or in early stages, the disease may be arrested by ordinary treatment; and although an animal at the time of purchase must be considered unsound, in numerous instances a transfer may be made, and the creature prove most useful and profitable.

False Quarter.—This is another disease of the hoof, dependent upon neglected or maltreated pricks and binds in shoeing, and suppurating corns, etc. If the intending purchaser requires an animal of value and endurance, the veterinary surgeon will sensibly advise him to avoid such certain causes of great annoyance.

After the condition of the parts already named is fully made out, the examiner next proceeds to scrutinize the sides of the chest, breast, sternum, sides of the abdomen, flank, etc. Their formation and relative connection will in a great measure decide the character of the animal, with reference to endurance, assimilative powers, etc., upon which he may be solicited to venture, but is not required to volunteer, an opinion. In addition to capped elbow, which was stated to arise from pressure of the shoe in lying down, it also happens sometimes that the same cause will induce disease of the sternum and its cartilages. Tumors, large and small, or hard and perforated by numerous sinuses, discharging thin matter, arise in consequence, and with certainty interfere not a little with respiration and animal health. Cicatrices near the eighth or ninth ribs in certain rare cases are suspicious. Their presence indicates the performance of an operation at some previous period, for the removal of fluid from the chest; and the examiner will be on the alert for other more decided signs of internal disease. In saddle horses, the marks caused by the rowels of spurs may be confounded with the cicatrices named, but an experienced practitioner will know that spur-galls are much further backward.

The *Spine*, in the doso-lumbar region, demands notice. If it is

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raised or arched upward, it will be well to bear the fact in mind until a later period.

Hernia.—Tumors on the abdominal region call for earnest attention. Sometimes these are formed by the bowels having escaped through a rent in the muscles, and confined within a sac composed of the skin as an outer covering, which receives the name of hernia. The flank, the umbilicus or navel, and all parts of the floors of the abdomen, are liable to these ruptures, and in all cases are to be looked upon as very objectionable, particularly in hard-working horses. Such conditions are termed *ventral herniæ*, in contradistinction to two other varieties known as *inguinal* and *scrotal hernia*. The latter are common to geldings and entire horses, and frequently possess severe characters. *Scrotal hernia* may be readily detected by the practiced veterinarian as a tumor between the thighs, augmenting the size of the purse upon one side only. It may, through inexperience, be confounded with hydrocele and enlarged or scirrhous chord, the *champignon* of the French, the result of castration in cases of careless domestic treatment. The ordinary reducible elastic nature of the hernia in question, and the hard, painful tumefaction, with more or less discharge from numerous sinuses in the *champignon*, will, however, be profitably plain to the qualified practitioner.

Inguinal hernia is usually not observable. It may exist at the time of purchase, and prove the means of causing death shortly afterward. A *post-mortem* examination reveals the true state of affairs. Adhesions may have occurred between the gut and walls of the canal, and strangulation results from the accumulation of stercoral matters, and impossibility for the intestine to pass outward again.

The mere presence of a knuckle of intestine in the inguinal canal after death is not sufficient to prove that it was there at the time of purchase, although that has taken place within a few days. Many circumstances conspire to bring about these states, and, therefore, hasty judgment cannot be permitted. The intestines are capable of very extensive movement, and under the accelerating influences of locomotion, rolling, leaping, etc., assume strange and distant positions. It is not uncommon to find invagination as well as other malpositions after death, which may be entirely due to causes of a *post-mortem* character. If there are adhesions between the gut and walls of the canal, or torn edges of the orifice in the muscles, the hernia is of remote origin.

With regard to the longest time which a herina of this character, having adhesions, may exist without proving fatal, we are not pro-

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vided with reliable information. Cases have occurred in the practice of the writer, in which every condition gave assurance that the disease had existed many months. The victims have suffered from recurrent colic, and at length succumbed under an extraordinary attack. After death an incarcerated intestine is found, having adhesions, aggravated by being densely charged with fæcal matter, and no power to return, becomes strangulated, from which the pathognomonic signs have resulted.

Adhesion of the intestines to each other at various parts within the abdomen is by no means uncommon as a result of *local* inflammation. Inguinal hernia, giving rise to colicky pains, may also produce the like between the gut and walls of the canal, when recently ruptured and undergoing the process of inflammation, relief being derived from rolling, by which the intestine is evacuated, but not removed from the canal. Repeated attacks take place by the frequent filling of the gut; the orifice or canal suffers further enlargement, a greater quantity of ingesta is accommodated, and at length the crisis arrives; the intestine within the canal has lost the power of contraction, other parts are active, and distend it by regular additions of ingesta; accumulations occur by virtue of the loss of the power of contraction, pressure occurs, circulation is stopped, pain arises, continues, suddenly ceases, and the animal dies. In pronouncing upon these conditions, the practitioner will be guided by the appearances present, bringing to his aid the physiological as well as anatomical peculiarities which bear upon such conditions.

The *hips* or *haunches* next require the examiner's attention. Sometimes one or both the anterior spinous processes, prominences immediately above and behind the hollow in the flank, have been fractured when the affected side appears *lower* than the other. Such a condition produces the appearance described as "ragged hips." When the bone has been fractured lower down, as the shaft or across the joint, acetabulum, no deformity takes place in early cases; but after a few days the lameness is much increased and deformity great. If the bones unite again, deformity continues, with an altered if not very defective locomotion, all of which is best observed by standing *behind* the animal.

The tail is next raised, and the state of the parts observed. In grey horses melanotic tumours are sometimes found in various degrees of development, affecting singly or collectively the anus, tail, or perineum. They may be found here when other parts of the body afford no evidences of their presence. In other horses hemor-

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rhoids are present, and in mares the state of the vulva will indicate whether foals have been born.

Glancing down the thighs, the position of the hind limbs will attract observation. This is sometimes peculiar, and the presence of congenital or diseased malformations may be detected. The examiner next returns to the side of the animal, and observes the stifle joint. At this part dislocation of the pulley-bone or knee-cap, patella, takes place; ligaments are ruptured, and the femoro-tibial articulation is liable to severe forms of disease, as is evident from painful bursal distension, deformity, awkward and difficult movement, with more or less lameness.

Hard, bony tumors upon the front and inner side of the leg (tibia) above the hock, may indicate kicks from other horses, blows from grooms, and even fractures at some period gone by. The latter are, however, fortunately very rare, but may be suspected when deformity, mal-action, or shortness of the limb exists in combination. The former kind of tumors are of little or no moment when fully consolidated.

Descending the hind limb, we arrive at the seat of *capped hock*, the point of the hock (os calcis). This defect consists of an enlargement, usually yielding and mobile, and looked upon with suspicion as an evidence of a kicking propensity. The character of the structures that enter into the formation of the part, viz., loose skin, synovial membranes and moving tendons, eminently favors the development of such a tumor from lying, as is the habit of some horses, upon bare stones, by kicks, falls, blows, etc. When caused by habitual kicking, there are usually other and even more palpable evidences of the propensity, in the shape of numerous scratches, remains of former wounds, with indurations, loss of hair, etc., besides peculiar behavior of the animal under manual examination or in the stable. When both hocks are capped, the legs exhibiting the conditions mentioned, accompanied by restlessness, active tail, watchful eye, and a disposition to jump and scream when touched, there are grounds for grave suspicions.

Lameness very rarely occurs from capped hock. If the condition is not accompanied by a vicious temperament, parties are known to each other, and confidence may be reposed in the statement as to accidental cause, a sale should not always be frustrated. The animal is decidedly unsound, but seldom of less value for useful purposes.

The tendon of the flexor pedis perforatus, as it passes over the point of the hock, sends off lateral branches of attachment. These

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are sometimes ruptured, and, owing to the course of the tendon being twisted *from beneath and the inner side*, around the tendon of the *gastrocnemius* to gain the point of the bone, it at once slips downward into a groove or trochlea upon the inner side of the os calcis. This is sometimes unscientifically explained, in lectures on veterinary pathology, as "sprung hock." Such cases are not presented, except rarely, in their severe form. It is after partial recovery has taken place, and when the owner has become tired of seeing the animal, that he tries to get rid of him, and the intending purchaser observes something abnormal, nothing decidely monstrous, but an impediment to easy and graceful action, and requests advice in his selection. The qualified practitioner, at once jealous of his reputation and security of his client, emphatically pronounces the animal not only unsound, but incapable of anything but a miserable existence, if compelled to move about.

Curb.—The *locale* of this affection is below the point of the hock, on the posterior aspect of the joint. The presence of curb indicates very frequently hard riding, severe leaps, rearing, sudden pulling up, blows, etc., at some previous time. Faulty conformation of the hock eminently favors their development, and it will then be mostly found that both joints are affected; a condition that must be regarded with suspicion, if the animal is not absolutely rejected. Consideration must be given to the labor for which the horse is required and the state of the hock or hocks. In certain conditions, they may form no objection to purchase at a lower price and under special agreement, particularly when not associated with badly-formed joints, or only one curb is present.

Thoroughpin depends upon the rupture of thecæ and more or less damage to the tendon of the *flexor pedis perforans*, immediately above the hock. There is doubtless also more or less disease of the articulation below. It consists of swelling, caused by distension of the bursal cavity, which as it spreads occupies considerable space between the os calcis and tibia, and beneath the tendons called the hamstrings. It is thus seen upon the outer as well as the inner side, and being viewed in the days of greater ignorance upon these matters as a solid substance going through, derived the unscientific name it still retains. The causes and nature differ little from those named under curb; therefore selection of an animal must depend greatly upon the exertion required of him as well as the stage of the disease. Such, however, would be a decided unsoundness, and there are fears of lameness under regularly severe work of any kind.

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Spavins affect the bones and other tissues of the hock. Enlargement of the bone may be confined to the antero-internal part, at the head of the metatarsal or cannon bone, or it may extend backward on the inner side of the joint, until the whole surface is involved in a hard painful tumor. Much of this is regulated by the form of the limb and mode of action. The disease is known as "bone spavin." At other times lameness exists without much or even any enlargement, when it is known as *occult spavin*. A third variety is known as *bog spavin*, in which the articular surfaces of the joint are undergoing disease, and accompanied by an increased secretion of synovia. The distension is witnessed upon the inner side of the hock.

The cause of spavins, as in *all* diseases of the hock, may be traced to faulty conformation, severe exertion and injuries, as sprains or blows, derived from adventitious sources. Hocks having short points, being narrow from before backward, and almost straight from above downward, beneath which is a small cannon bone, are very prone to the diseases enumerated, and by which the extended general usefulness is greatly impaired. When such morbid states are actually present, there can be no question of unsoundness. To decide always upon the presence of spavin is not an easy matter, and a deficient knowledge of anatomy and general conformation of different animals renders the task still more perplexing.

The time required to develop a spavin is a matter of much moment to the veterinary surgeon and his clients. The question is one that is calculated, by proper solution, to affect materially many cases of dispute, and hasten them to a more speedy termination. It is no part of the object of the writer to declare that a certain period can be accurately determined as that at which the spavin can be said to have originated; but he believes a near approximation may be made, and sufficient for all practical purposes. Let us suppose a horse was purchased on the first of any given month, and at that time is passed by a practical veterinarian as sound. In one week or ten days the animal falls lame in one hock, and gives evidence of pain, but no outward exemplification of spavin. Rest and treatment appear to effect some good, but on returning to work lameness again arises. Gradually enlargement shows, and in eight or ten weeks a spavin is visible. Such a case is an example out of many that occur, and about which there are absurd law cases. In fact and physiology, there is everything to affirm that the spavin is one entirely connected with the purchase. It is well known that a spavin cannot be formed in an hour; it is the work of weeks, and the best proof is the formation at a distant

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date from the first noticeable lameness. If, on the other hand, lameness occurring within a similar period, but rapidly attended with visible bony enlargement, as, for instance, within a week or ten days, there are grave doubts that the disease is dependent upon causes operating prior to sale.

It more usually happens that the *existence* of a spavin is the question of dispute in a court of law than the time required to develop one, and hocks badly affected have been pronounced by old practitioners as free; a decision which, after the bones have been divested of their tissues, proves to be erroneous. It is no proof that, in lameness in the hock, unattended with visible bony enlargement, there is no spavin. It is well known that a small enlargement frequently produces harassing lameness, and if time is given, and the horse kept at regular work, the effect would be produced at a later time in the shape of substantial bony spavins. If it were noticed, lameness *always* accompanies the contraction of spavin, and movement is afterward interfered with. After rest the horse is lame, but becomes sound by exercise, and this goes on sometimes before visible enlargement occurs. A fresh horse going out for exercise is apt to sprain the hock; and if there were a greater disposition among horsemen, grooms, and others "horsey" in their pursuits, to speak the truth and exercise their faculties of common observation, there would be less difficulty in judging for the right, and thousands of pounds preserved in the pockets of injured men.

Weed, *farcy*, and *grease* are affections chiefly seen in the hind limbs. The former consists of general swelling as a result of indigestion, which, after repeated occurrence, leaves a permanent thickening of the whole limb. It is principally confined to gross feeders and the heavier breeds of horses. *Farcy* is a constitutional affection, whose local signs are aggregations of small hard tumours, which occur in the course of veins and near glands, and after a time burst, but do not heal. *Grease* is an erysipelatous disease of the skin about the heels and fetlock, attended with offensive discharges and protracted recovery. Evidences of the present or previous existence of any of these affections will be sufficient to advise a purchaser who values his animals to avoid such. Weed and grease are tiresome complaints, but farcy is highly contagious, and the latent form of glanders.

Stringhalt.—By this term is understood a rapid twitching upward of one or both hind legs during movement in the stable or progression. In some cases it is associated with or dependent upon tumours within the lateral ventricles of the brain, in others with *ramollisse-*

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ment, softening of the brain; while many occur in which no anatomical lesion can be detected. For some purposes, horses affected with this disease would prove unobjectionable. It is, however, a decided unsoundness, and usually increases until the twitching becomes violent and offensive. A purchase will depend upon the work it is intended the animal shall perform, and also upon the possibility of complications with which it may be or is associated. As pleasure animals, those suffering from the affection are a complete nuisance; but as slaves in slow and heavy work, they may be tolerated.

Cutting and Brushing.—These are terms employed to denote the extent of damage inflicted upon one leg by the opposite foot during progression. The turning in of the toes of the fore and the heels of the hind feet, are usually looked upon as common causes; but these faults, even when extended, appear sometimes to have little effect. Doubtless such a formation may assist in the habit, but as a rule the common cause resides in the shoeing and driving, particularly when the animals are in low condition. Once thoroughly contracted, it is difficult to dissipate the habit without a complete reformation of abuses. The writer has known animals upon whom every device in form of shoes has failed "to take them off the cut," and notwithstanding for years have continued to injure the legs, until pain and lameness compelled them to rest, effectually prevented by the use of light shoes, and the exercise of common humanity in feeding and riding or driving. Horses differ in their powers of endurance as much as we, but they are too frequently regarded as a steam engine, capable of working up to a higher standard than the registered nominal power. While the bruises inflicted by cutting and brushing render the animal temporarily unsound, the habit should not in all instances be allowed to weigh against purchase. Many a good and well-formed animal, in a low and weak condition, might be rejected, if the plea of temporary unsoundness is viewed in a severely critical light, and no test would be given that distinguishes a downright screw or weed from the better class or breed. Long legs, narrow chests, hen toes, calf knees, sickle hocks, and splay feet, run more or less in company, and when they have secured in conjunction low condition, such animals must be totally avoided for hard work, as they are doomed to pass more hours in the stable than is consistent with profitable horse management.

Affections peculiar to those parts below the hock are to be detected as in the fore limbs, details of which have been already given.

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Bursal enlargements and distensions of synovial thecæ of tendons, in whatever stage and degree, undoubtedly constitute unsoundness, indicating respectively disease of articular surfaces and rupture of tendons or their sheaths. Although absolute lameness and loss of usefulness may not always characterise, or follow such, in each case, it is nevertheless the duty of the examiner to point out their nature and existence, with the probabilities attaching to each. When large and important joints are the seat of these lesions, fear of awkward consequences is to be entertained. In the case of enlarged tendinous sheaths, results are rather different. *Wind-galls* are a common example, and animals rarely prove lame from them alone. The passing or rejection of animals affected with these will depend greatly upon their state, as under connection with disease of contiguous articulations, judgment will be of a more important nature.

The veterinary surgeon having carefully satisfied himself of the condition of the animal by the united assistance of his eyes and hands, will now proceed to put him under the effects of exercise and various evolutions, in order to confirm or dissipate already existing suspicions as to disease, and detect diseases that do not otherwise become manifest.

When directing attention to the spine, in the region of the back and loins, any tendency toward being arched upward, it was stated, should be noted for subsequent test. The examiner will now take the bridle in his hands, and cause the animal to go backward rather forcibly, then round from left to right, and right to left. Great stiffness proclaims anchylosis; while tenderness or pressure, difficulty in accomplishing the movements, with tendency to reel or "swing" the legs, are signs that are identified with the "kidney-dropper," *i. e.*, one having suffered sprain of the muscles of the loins (psoæ muscles). Such an animal is worthless. Wasting of the muscles of the haunch, with defective movement of the limb of that side, may arise from plugging, embolism of the main arterial trunks, fracture, etc., of the pelvis. While the foregoing test is being carried out, the operator will also attentively watch the behavior of the animal in other respects, and for equally as important purposes. If there is any cough or grunting sound emitted, he will remember it for a subsequent opportunity. If there is an aversion to have the head touched, or tendency to raise it suddenly upward and backward, and at the same time to rush upon his haunches; if he exhibits the "haw," as in tetanus, and remains in the position described, with hind limbs wide apart and

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as far forward as the fore feet, and in violent convulsive movements, there are doubtless existing severe cerebral diseases, as tumours on the choroid plexuses, with more or less softening, abscess of the brain, etc. Such an animal is known among low dealers as "a shiverer," and is not only unsound, but dangerous to himself and others.

The horse may now be walked out with a *loose* rein, the groom being requested to lead him, in as straight a line as possible, the distance of 100 yards or thereabouts and back again. During this walk will be observed the pace, mode of carriage, as well as any false action or lameness evident in such exertion. It is well to repeat the walk several times, and thus take special opportunity for accurate investigation. This being concluded satisfactorily, the horse is next *trotted* over the same distance, the reins being held at half length in order to insure freedom of action, and the proceeding is repeated as often as it may be requisite to bring out palpably any lameness or mal-action not developed in the walk.

The trial is next extended to the gallop, through which the examiner should be prepared to test the horse himself, and for that purpose places a saddle upon him and mounts. He can thus make a more thorough examination of his paces and qualifications, and may more frequently detect slight evidences of disease, causing stiffness or lameness, as from spavin, etc., even when such are not visible in the walk or trot in hand. At first the animal is ridden quietly away from the place, making choice of a road that is frequented as little as possible. After a time he is pushed into a trot, the rider using the snaffle in preference to the curb, which, however, should be ready at a moment's notice, and go on thus for a mile or thereabouts. All the time the attention of the veterinary surgeon is directed to the energy with which the horse goes through the work, the way in which "he gathers himself," and uses his legs, his ears, and his eyes, eager to catch anything abnormal, whether of locomotion, vision, hearing, circulation, respiration, etc., preparatory to a more severe trial. Shortly rising ground is reached, an undulating pasture or green lane, so much the better; and, without having slackened rein, the animal is urged into a brisk gallop over three or four hundred yards. The respiration is now accelerated to the utmost, when the rider rapidly, but carefully, pulls up, dismounts, and places his ear to the nostrils and throat upon each side. If no abnormal sounds have been heard during the trot or the gallop, such may be heard now, and traced to the nostrils or larynx, and upon the magnitude of which will depend whether the animal is to be pro-

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nounced a "roarer," "high-blower," "whistler," etc. Difficulty of respiration, inability to withstand the exertion, etc., may indicate disease of the lungs, heart, etc., for which further scrutiny is required.

After being fully satisfied, the rider remounts, and returns to the place from which he started, taking care to keep the animal in a gentle trot the whole of the way. On arrival, the saddle is quickly removed, and the horse led into a quiet, loose box, and the examination proceeds by auscultation and percussion of the lungs, in order to ascertain not only that those organs are perfect, but also what may be the cause of any abnormal sounds heard during the gallop, etc., which, according to their nature, will be referred to their proper source.

Broken wind, in confirmed cases, is readily detected even during quiescence, but in slight cases movement and auscultation are required. By these means *consolidation* of the lungs (the result of previous congestion or inflammation), *tubercle*, *vomica*, *obliteration of bronchial tubes*, *heart diseases*, *etc.*, are decided to be absent or present.

Organs of Vision.—The last part of the examination being concluded, the veterinary surgeon then scrutinizes the eyes in the strongest daylight. In doing so, a white necktie, hat or shirt, waistcoat, etc., must be concealed, as by their reflection within the pupil appearances may be falsely estimated. Any difference in the size of the eyes, observed in the preliminary survey, being remembered, will now be tested more severely. The pupils also are noticed, their relative size and degree of dilatation being points of importance, particularly if the eyes are staring and glassy. These, in conjunction with a blundering gait, raised head, high action, or tendency to shy at common objects, are signs of disease. To determine the nature, the horse is put backwards within the stable, to witness the effect of a gradual retiring from full daylight; if no action takes place in the pupils, the affair is still more suspicious. The stable is now closed, so as to produce total darkness, in which the animal is kept for five minutes or thereabouts, and the eyes are then examined by a lighted lamp or candle. By these tests *paralysis of the iris* will be known by its immovability; also paralysis of the optic nerve by the great tolerance of light, a condition known as *amaurosis* or *gutta serena*. Other and rarer forms of disease are also detected, as *glaucoma* and *dislocation of the lens*, with the more common and various forms of *cataract*.

All movements that are adopted in order to prove the power or absence of vision in horses, should not cause agitation of the atmosphere in the neighborhood of the eyes. The animal is apt to close

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the lids in consequence of this rough and unreasonable test, and persons are simple enough to believe that vision is thereby proved to be perfect. If the finger is extended, pointed straight at the organ, and carried rapidly toward it from a distance, it will be found to answer more perfectly than the fanning process. The adoption of various means to startle a horse when in a stall, violent flagellation, etc., to prove whether he be a "roarer," and pinching the windpipe to prove a cough, are barbarous measures, which the practiced veterinarian can supersede by sound judgment, and intellectual estimate of the causes of disease, and the signs that characterize them.

Draught horses are not required to gallop. They may be put through a sharp trot up a hill, and, if possible, tried in a cart or wagon. Although many are affected with roaring more or less, slow work, combined with good management, does not frequently aggravate the disease; and, bearing this in mind, many useful animals may be obtained, the price being regulated in accordance.

Occult Diseases.—Besides the defects already mentioned, there are diseases occult in character, which primarily interfere but little, or probably not at all, with health or condition, but after a time suffer aggravation and cause death. In all animals brought up by poor farmers, when their youthful wants have been neglected, the food and water impure and deficient, there is always danger of latent disease being present. After such have been "broken in," better food allowed, and probably severe or irregular exercise is taken, additional causes are found to operate and give activity to the dormant affection. For a time the condition has improved, and the animal promising well, is received into the stables of the town tradesman, and, under the influences already named, signs of ill condition, indigestion, etc., occur, and probably recurrent colic. Appropriate remedies are given, and throughout several attacks prove successful; meanwhile extensive complications are going on. Absolute weakness and lassitude characterise the movements, the appetite becomes capricious or ravenous, offensive diarrhœa alternates with constipation, an obstinate cough annoys every one in attendance, the animal is "pot-bellied," and looks a perfect disgrace. At length the climax is at hand. A severe and protracted case of colic ensues, from which no relief is gained, and the creature dies. Upon examination the lungs are found to be diseased, abscesses and points of calcification are found, with adhesions and consolidation. The mesenteric glands may be enlarged or tumefied, and others suppurating, having discharged an ill conditioned [illegible] fluid among the intestines. In such cases the question of the exist-

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ence of mesenteric abscesses is not of such a recent character as usually supposed. The conditions, also, which bring them about are eminently chronic in character, and altogether incapable of activity, as in purely febrile and inflammatory disorders. Tumefaction and elaboration of matter are imperfect, and suppuration often the work of months. Instances have occurred, in the experience of the writer, plainly indicating that the absolute causes of such diseases may be dated as far back as twelve months. In pronouncing upon them, however, much information is still needed by the veterinarian. The history of many animals is not forthcoming when an examination is made, and the signs are not sufficiently advanced to attract attention; they occasion no interference for some time, and, on this account, are too often looked upon as recent affections when death ensues.

Renal, Cystic, and Urethral Calculi are sometimes present at the time a horse is submitted for examination. When there are signs of debility, loss of flesh, defective urination, etc., the practitioner would be induced to make a special and searching investigation, such as is directed by the requirements of the case. The suffering animal would of course be pronounced unsound, and the examiner would also recommend his client to avoid having anything to do with him. Similar remarks apply to *albuminous nephritis*, *diabetes*, etc.

Tumors (*non-malignant and acute*), *Pustular Abscesses*, etc., whenever they are present, constitute unsoundness. They are, however, of a curable character, the former being excisable, and the latter amenable to therapeutic measures. Now and then the practitioner meets with tumors and abscess of bone, the chronic or cold abscess of soft tissues, melanosis with and without a carcinomatous complicity, abscesses in awkward parts, malignant tumors of bone and soft parts, etc. In all the judgment of the veterinarian will be taxed and should prevail, purchase being made, in accordance with the simplicity of the affection, at a lower price, or by agreement for delay, until the disease be dissipated.

Serous Cysts or *Abscesses* also occur about the knees, thighs, haunches, etc., as a result of blows, falls, etc. In all cases, they are of a simple character, and give way to proper treatment. When present in the vicinity of joints, they may be confounded with bursal enlargements, which, however, an experienced veterinarian will avoid. During their existence the animal is unsound, but a purchase may be effected conditionally with respect to them.

Volunteering Information.—There is much to deprecate in the principle of affording, when not asked for, any information respect-

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ing the animal under examination. Nothing is more common than for the purchaser of a horse to put questions to the examiner that are totally beyond the object sought, which, if yielded to, beget a conversation into which an unpracticed hand insensibly falls, and usually commits himself in a fatal manner. He should bear in mind the animal is presented with a view of having the horse's soundness decided. It forms no part of the veterinary surgeon's duty to point out anything further. The horse may be a kicker, jibber, runaway, bad worker, but with those properties he has nothing to do. The price may be also presented for his opinion, but it forms no business of his, and is best let alone. The value of a horse is not always represented by money. What cost £20 to-day is sold for £60 before a week elapses; and, in other cases, the value of the animal is formed by his fitness for a certain occupation, an estimate of £50 being no more than justly applied to him, while in a market he would be too dear at half the sum.

The great question clearly, therefore, becomes very simple. "Is the animal sound?" If veterinary surgeons would confine their efforts to this point, much good would accrue to the profession. What if the animal has a narrow chest? Is he safe to cut or brush? What if he has a long carcase? Must he always purge, and be a bad doer in consequence? But he has sickle-shaped hocks? Well! must he inevitably put up a spavin, curb, etc.? What a short, round barrel he has? Well! will he turn out broken-winded? He has a short thick neck; must he become a roarer?

Every sensible veterinarian knows that no horse was ever perfect, and none have defects but they are counterbalanced by good qualities to some extent. Besides many conditions, even of those named, are brought on by treatment in the stable or at work, and are in no way connected with the form, or other supposed predisposing state. In the multitude of ills to which horse-flesh is heir, many may seize upon it having far less claim; and a veterinary surgeon must be very wise if he can see his way clearly through the conditions that surround the animal to pronounce definitely upon them without fear of error. He should by all means confine his remarks to the points of soundness, and volunteer no information beyond it. Nothing tends to prejudice the transaction more than intelligence of a prophetical character. It would be wise to remember this; and further, that the prognosticated result is no nearer being fulfilled, however strong the prediction. If there were less disposition to afford adventitious intelligence, there would be fewer

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inquirers after it, and the subject in hand would be more rigorously adhered to, a result likewise more favorable to client as well as practitioner.

The great demand for judgment in outside matters has been also actuated by another cause. Professional men have too long entertained the idea that horse-racing, horse-judging, horse-dealing, and commission on the sale and selection of horses, in fact everything "horsey," is inseparably connected with veterinary practice. It is a great mistake, by which more weighty matters are lost sight of. If we had less of the "horsey" element, the more scientific and reliable we should become as a body. As it is, practice becomes too often of an empirical character, and intended representatives of science fall away from position and respect, and then fail to render the same public service as is derived from the cultivation of abstract knowledge by veterinary surgeons everywhere abroad.

Similar arguments may be raised against the common practice of *recommending* horses. No error can be more fatal in course of time to the veterinary surgeon, although his advice may, in both instances, be founded on the greatest sincerity and varied experience. Circumstances of which he can have no idea nor power of control, connected with the future life of the animal, are subversive of the predictions enunciated; but, as a rule, every calamity not predicted that can wait upon ignorance and bad management arises from time to time. Thus it happens that a horse, apparently possessing every good quality, under adverse states, turns out very indifferently, and he who recommended him alone receives the censure. The usages and management of establishments vary much, and particularly those of tradesmen who keep but one or two animals. Such men are frequently not only ignorant of the nature and requirements of a horse, but also extremely conceited and too penurious to allow the animals their proper share of comfort and attention. With them, as a rule, horses have the least respect, and one recommended by a veterinary surgeon is supposed to possess unparalleled qualities, and generally proves the worst enemy he can have throughout his practice. In some large establishments greater safety is experienced, as a better knowledge of horses exists, and the advice of a veterinary surgeon is attended with greater weight. But even here there are circumstances that tend to mar greatly the workings of a straightforward course. Grooms and coachmen are prone to hover about; "for where the carcase is, there will the eagles be gathered also." Fees and horse-dealing are inseparable. Without them, the practice would

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lose its charms; and the success or suitability of an animal is reported only in accordance with the "tip" that seals the bargain, and makes the screw "as sound as a bell." The less the veterinary surgeon has to do with either, the more successful and respected will he become; the greater also must be the benefit he will confer upon those who succeed him, and the science which he professes to understand.

The conditions under which horses are subjected to the scrutiny of a professional examiner, admit of judgment being given under three forms, viz.: 1st. As being *sound;* 2d. *Unsound*, for which they are unreservedly rejected; and 3d. *Unsound, but possessing no defects that imperatively call for rejection.* What has already been advanced will serve to prepare the way for the reception of further statements.

1. *Soundness.* — This has been correctly interpreted *health;* unsoundness, therefore, clearly implies *disease.* The law of Britain sanctions no other conclusion; however verbose may be the interpretation, the result is at the end just the same. If it were generally understood and appreciated, we may venture to state there would be fewer misunderstandings and less difficulties surrounding all horse transactions. All the difficulties arise from the general desire to give a more extended meaning in practice of the term soundness. Many professional men tacitly admit an unauthorized extension; while all dealers endeavor to confine the degree of unsoundness to such conditions only that are attended with great debility, lameness, emaciation, etc.; or, in other words, to such animals as are not in a profitably saleable condition. The law, however defective in other points, clears up this in an eminently satisfactory manner. The veterinarian therefore, who seeks to pursue an honorable and unfettered course, will perceive before him duties of a plain and unmistakable character in the examination of horses. They must be sound or unsound; there is no medium position in quality; and to pronounce faithfully on these matters, he needs to be above all fear as to consequences, perfectly indifferent as to the opinions and proof against the obtrusiveness of either purchaser or seller; and with a full confidence that he is able to detect all conditions that are palpable, and detract from the legal standard of perfection. Under these capabilities, the examiner declaring an animal sound, no further comments are needed. We therefore proceed to the second question.

2. *Unsoundness.*—In this department also the examiner has very plain duties to perform. Whatever may be the defect, whether its tendencies are to create lameness or stiffness, shorten life, interfere with vital functions in any way, and can be pronounced *disease*, the

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examiner is justified in stating the animal possessing it to be unsound. In his estimate, he will take cognizance of all organic diseases: ossification, partial or complete, of joints; enlargement, as a result of sprain or total rupture of tendon or ligament; fractures of bones at remote periods, particularly when attended by deformity; loss of muscular tissue, as a result of abscess or laceration, and replacement by adventitious tissue, all simple diseases, as colds, however slight in appearance; malformations, the result of disease; loss of parts; morbid growths, as tumors of hard and soft parts, particularly those of a malignant character, etc. Want of symmetry is no part of the scrutiny, although such may amount to a defect, and prove a predisposing agent to disease. Thus, small eyes are very prone to ophthalmia, but the organs at the time may be perfectly sound. Sickle-shaped hocks may be free from their many affections; weak and round cannon bones destitute of even the appearance of splints; upright pasterns may have no ring-bones; perpendicular hoofs are not inevitably associated with side-bones and "grogginess." Calf-knees" and "hen-toes" are not unsoundness, and cannot be noticed as such; but in private memorandums, registers, or the note of identification to all certificates, the examiner should carefully note their existence. They are the safest test by which the same animal may be recognized when presented for another opinion, as well as a telling proof that the examiner has given the subject his utmost attention.

3. *Unsoundness, not imperatively calling for rejection.* — The majority of animals presented for examination will be found to possess defects of some kind or other; but the examiner need not, however, feel that, by fulfilling his duty in pointing out their nature and presence, he inevitably prejudices a sale in consequence. If the legal interpretation of soundness is literally adhered to, and it is only honest that it should, few sound horses would be available, but no less number used in consequence. The object of examination is to investigate and find out the existence of depreciating influences, that each animal may be secured at a consistent price; and if that object were more honestly observed in all horse transactions, a much greater impetus to the breeding of sound animals would be given, than can possibly accrue from the present system of degeneracy that chacterizes turf practices, which above all proceedings should be its stay and suppport.

Horses possessing defects, as already described, are legally considered unsound. But notwithstanding this, the properly qualified examiner, by strict acquaintance with the science of veterinary medi

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cine, is enabled to separate many defects from those of a serious nature and confidently assure his client that, although he may puchase an unsound animal, the defects that bring him within the category may never occasion the least inconvenience. A wind-gall, for instance, although positively an unsoundness, rarely occasions lameness alone. Many animals possess them, and continue to work soundly to an advanced age; but when of an aggravated character, and associated with disease of contiguous joints, arthritis, etc., the subject comes within the first category. Many splints and tumors of bone, from their complete isolation from joints and full consolidation do not warrant rejection. Spavins affecting only the postero-internal and inferior face of the hock seldom produce lameness of any moment or continuance. Slight cases of cough, certain skin diseases, corns, sand-cracks, weak feet from over-paring, serous and even pustular abscesses, strangles, influenza, and other simple diseases, capped hock, dislocation of the patella in young animals (sometimes also in old ones), with many other conditions, come within the list of unsoundness, but of a temporary character; and others, although not alterable by treatment, may not interfere with the requirements of the animal.

The examiner here states the nature of the defect constituting unsoundness, and his opinion that under any reasonable treatment, the animal is not likely to suffer from the unsoundness referred to. It is well known that there are objections to such a system of close scrutiny, it has been termed "splitting hairs;" but, in the name of all rectitude, which is the more upright proceeding, to give a certificate of soundness in the face of such defects, and say nothing about them; or to describe their nature and existence, and state, by knowledge and experience, that with fair treatment, they will produce no inconvenience, and the animal for certain purposes is reduced in value *very little* indeed?

When slight diseases are present, the most proper course is to urge that an examination under such circumstances is not fair to either party; when if the purchaser is desirous for the animal, another day is fixed, he is examined, and may be found proof against the effects of changes and other adversities that surround a new purchase, and are so little appreciated by virtue of their not being understood or endured.

It is a common practice with some, when a defect of the kind alluded to is found, to obtain a warranty from the dealer, in which a special clause is inserted to the effect, that if lameness

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or other inconveniences arises within a given time, the animal must be returned. Such a course is eminently against the seller, as, in the majority of cases, the animal does not receive a fair share of consideration at the hands of the new owner, but in all probability endures severe testing on account of the defect, and returns lame; while, under the exercise of reason and humanity, he would continue in workable soundness and usefulness for many years.

When such disease or defect exists, and it is reasonably supposed that ignorance of horses and their capabilities, with other heterodox practices, prevails in the new establishment, it is best to err upon the right side, and, stating the cause of unsoundness, decide to return an unqualified decision in accordance. The writer is acquainted with an individual who constantly practices the course of obtaining a warranty, specially including a spavin or ring-bone, etc., as described; but there is no advantage to be gained. If the defect proves capable of withstanding all the influences to which it is subjected, the new owner, after the lapse of time, must retain the animal at the price agreed; and, if he turns out lame, sending him back, and receiving another, may be productive of little improvement, and the process, on repetition, becomes expensive, the owner disgusted, and an amount equal to the price of a younger and sound animal is very soon squandered away, without being one jot nearer the desired end.

Is a habit unsoundness?—This is an important question to all parties. Thus shying, one of the greatest nuisances belonging to horse flesh, is frequently the cause of complaint. Crib-biting and wind-sucking, synonymous terms, but which are too commonly used to convey the idea of two diseases, signify also a habit. Another animal, when in the stable, stands stretching with the fore and hind limbs as far apart from each other as possible; a second is found as far backward from the manger as his rope or chain will allow; and a third will disgust the owner, by vomiting the food taken, after a hearty meal and previous long abstinence. In all such conditions the degree of soundness can only be given on the dissociation from disease and structural lesions. Some horses shy only when fresh, and after confinement from busy thoroughfares and the open air; but others adopt the habit from imperfect vision, structural changes having arisen within the organs from diseased action. In the first instance, the cause being known, a decree of unsoundness would not occur; but in the second, is imperatively called for. Similar exceptions and judgment are admissible in the other conditions named, as we know that crib-biting has its origin in dyspepsia, and becomes a disease in

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consequence of structural changes. Stretching in the stall may arise from a fit of indigestion, but, if it continues, disease of the kidneys may have arisen. Likewise a horse that adopts the habit of standing back in his stall, doubtless commences the practice from an imperfect flooring, but in time suffers from severely degenerated flexor tendons, constituting one of the worst degrees of unsoundness.

Redhibitory defects.—But little is known in Britain of the circumstances and conditions taken notice of under this head. The term implies "making null and void," and is applied to the sale of animals on the continent, in order to provide against loss that might occur to the purchaser in consequence of the appearance and fatal termination of certain latent or occult diseases. In this country, to obtain redress under such conditions, involves an action at law, and an expensive process, with hard, and not always faithful, swearing. What is more anomalous, nearly all horse cases of importance are decided by jury. It may be possible that twelve men are desirous of giving an honest verdict; but it is *impossible* those men, because they comprise a jury, can be learned in such an abstruse question to them as disease in its various forms and results. It may be an impartial mode of administering justice, but certainly is not a correct one.

In those countries abroad where redhibitory defects are recognized, no case at law is required. The sale of every horse is regulated by and in accordance with the understanding that, in the event of certain hidden diseases appearing within a subsequent time, the animal must be received again by the former owner, who, in case of death, becomes responsible. Under all circumstances, however, the purchaser must prove that evidences of the disease in question have been noticed prior to his taking the animal, or the seller does not become responsible. In some parts of the continent the law only recognizes one or two diseases for which animals can be returned, as in Italy the disease called staggers-megrims, broken wind, and hæmaturia (bloody urine). In France, where they pay much greater attention to these matters, the list is constituted as follows: 1. Periodic ophthalmia; 2. Epilepsy, known here as megrims or staggers; 3. Glanders; 4. Farcy; 5. Chronic diseases of the chest; 6. Immobility or apoplexy (coma); 7. Broken-wind; 8. Chronic roaring; 9. Crib-biting, without evidence of wearing of the teeth; 10. Intermittent inguinal hernia; 11. Intermittent lameness, due to old-standing disease.

It would be well for Britain if redhibitory defects among horses and cattle were recognized. The means by which justice may be done to the purchaser, after the development of latent or occult dis-

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eases, rests only in such measures as collateral aids to an efficient examination; the beneficial working of such must be at once apparent, after what has been adduced in reference to occult diseases.

Examination of animals under dispute.—As long as practitioners choose to entertain different and sometimes erroneous opinions of disease, so long must we, as individuals, be at variance upon the question of soundness, notwithstanding the law has already set the question at rest for us. In perfect disregard of this fact, private interpretation is given as the standard, and we continue to endure dispute. Much error is undoubtedly abroad on the matter, and the sooner legislators step in and reform the abuses in connection with the law of warranty the better for all classes. From disputes that continually occur in consequence of horses falling lame after purchase, the accuracy of a previous certificate of soundness is questioned, and another opinion is required in order to set it aside, to procure a return of the animal. The veterinary surgeon here requires to be on his guard, and use every vigilance in order to avoid an incorrect decision. It will always be a difficult matter to determine accurately how long a disease may have existed, but the exercise of common understanding in well-known laws of pathology and physiology will generally lead to a useful result. Frequently the most stupid questions are raised, and practitioners swear directly opposite. One asserts that a spavin, splint, or navicular disease is present, and another swears there is nothing of the kind. It is therefore clear that one must be wrong, and, *caveat actor*, his knowledge of his profession suffers serious damage.

The information given in certificates attending these examinations is somewhat puzzling at times. We hear of "old standing diseases of the hock," "disease in the coronet," "a defect in the wind (or breathing)." Such remarks not only point to deficient descriptive powers, but probably also to inferior pathological as well as physiological knowledge. Similar remarks apply to the *post-mortem* examination of animals under dispute. We hear sometimes of horses having "died of intense inflammation," "rotten liver," and "old standing disease;" affirmations destitute of proof, accuracy, or information. It is doubtful if there is much desire, and in many quarters even capability, for making careful *post-mortem* examinations. Recently the writer was consulted in reference to the cause of death among some cows. Several had died from acute indigestion, and a farrier of repute declared that on opening the bodies "nothing whatever could be found."

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When an examination of a carcase has to be made, there are certain precautions to be observed, and the practitioner must be prepared for severe and even harsh criticism and cross-examination upon all points in which information may be weak or apparently wanting. Nothing tends so much to deprive the opposing party of power as the careful mode of examination, and accurate detail of conditions, as they have been presented. The first proceeding is to obtain authentic evidence as to the length of time the animal has been dead. This will assist in clearing up many points that belong to *post-mortem* conditions, and are sometimes mistaken for the results of disease. Cadaveric rigidity, its presence or absence, state of general repletion or distension of the abdomen, emphysema of subcellular spaces, the side upon which the animal has been lying, color of membranes, state of skin, etc., are items worthy of record. As soon as the integuments are removed, the state of the subcutaneous vessels and color of the muscular system is carefully remarked, when the carcase is turned on the back.

The cavity of the abdomen is next opened, when the state of the stomach and intestines, as to repletion, distension, or inanity, are carefully recognized, and each organ, as the liver, spleen, pancreas, kidneys, bladder, etc., included in a special description.

The carcase is now thrown on the side, and the muscles of the upper flank and abdomen taken out from their several attachments. Afterward the sternum is separated carefully by a saw from all the cartilages of the ribs. Next the intercostal muscles are successively divided from one end to the other; and, lastly, the diaphragm separated from the ribs and cartilages. Each rib is then wrenched from its vertebral connections, which exposes the thorax and its contents for record and observation *in situ*.

The size, color, and even weight of organs often afford valuable means for important results. The latter is sometimes of the utmost signification. Gravitation and extravasation of blood (*ecchymosis*), *petechia*, blood-stains, turgescence of vessels, etc., must not be confounded, as is frequently done, with inflammation, nor the mesenteric trunks with strangulation, which is also not an unfrequent error, as an attempt to set up a case of enteritis.

The next step is to examine the principal vessels and nervous centers; the indications afforded by them frequently refer directly or remotely to the cause of death. In all statements, the conditions should be given in unmistakable terms. There is too much ambiguity in such remarks, as "the liver was soft and easily broken, kidneys flaccid and discolored, bladder scarcely normal," etc. Nothing is

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learned from them, but rigid cross-examinations generally prove their worthlessness in law cases.

The last portion of the subject is not at all unimportant. When a veterinary surgeon is called upon for evidence in a court of law, as touching the soundness or presence of disease in horses under dispute, one of the most powerful means he can use is, to furnish the truest state of affairs to the solicitor employed on his side. This should comprise all circumstances that bear upon or against the cause. It is thus that little evidence is frequently such as to effect a great amount of good, and that adduced from an opposite side, virtually weak from a want of consideration, effectually shaken and destroyed.

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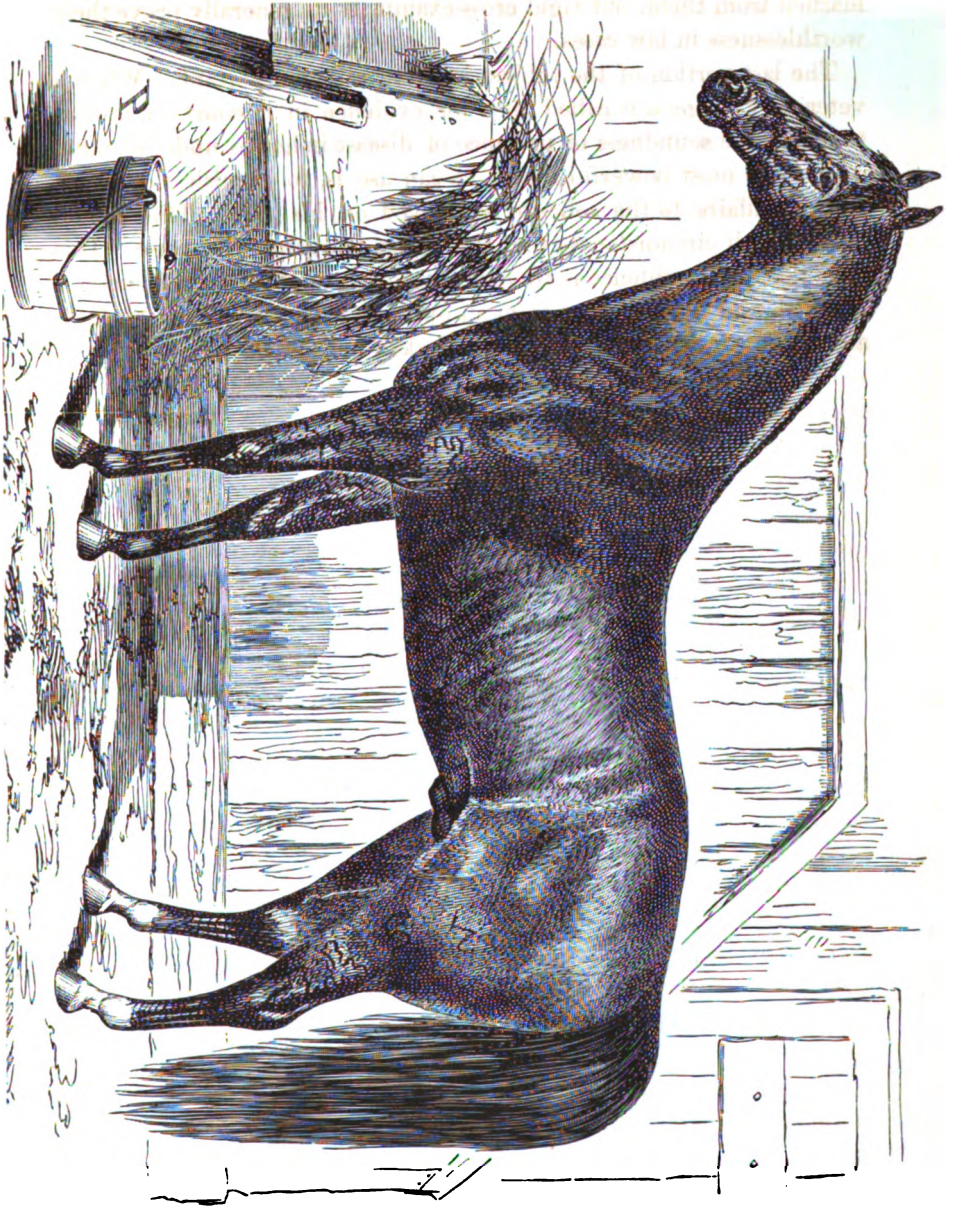

CONTINENTAL.—Bay Stallion, 15 hands 3 inches, bred by FREDERICK LAWYER, Brownville. Property of HUNGERFORD & WHITE, Adams, Jefferson Co., N. Y. Sire, Bacon's son of Ethan Allen; dam, a buck Messenger mare. Winner of the special ($200) prize at the New York State Fair, at Rochester, 1868.

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THIRTEENTH REPORT

ON THE NOXIOUS, BENEFICIAL AND OTHER INSECTS OF THE STATE OF NEW YORK.

By Asa Fitch, M. D., Entomologist of the Society.

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Bean aphis, *Aphis Rumicis*, Linn. (Homoptera. Aphidæ.)

Crowded together in clusters upon the top of the stalks and under side of the leaves of the English bean, the poppy, dahlia, and several other plants, a small black plant-louse with pale shanks, the pupæ with a row of mealy white spots along each side of the back.

This aphis is one of the most pernicious insects of the group to which it pertains. So much notice has been attracted to it in England that in different sections it has there obtained the names of the black dolphin, the collier, and the black fly. It is liable to suddenly become excessively numerous, and when thus multiplied it falls upon plants other than those which it ordinarily infests, and plants which are widely dissimilar in their nature and not at all akin. And it is also liable to suddenly vanish and totally disappear. We are informed by Mr. Curtis (Farm Insects, p. 387) that, "During the summer of 1847 the prodigious swarms of this aphis which suddenly covered the young shoots and under sides of the leaves of almost every plant, so that the surface was blackened by them, was unprecedented, as far as can be ascertained, and it excited the attention of the public generally. * * * They died in closely packed groups, with their beaks thrust into the leaves, and their wings erect; and possibly were either poisoned by feeding on juices not adapted to their constitutions, or they might have been held fast by the drying of the leaves in which their rostrums were imbedded. * * None were observed the following year." He also states (p. 68) that in the year 1854 this aphis was excessively abundant, everywhere in England. In a communication to the Gardener's Chronicle, the last of August in that year (p. 550), he reports that about the beginning of that month there were myriads of this species in the neighborhood of London, and on the

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evening of August 1st they were seen in prodigious numbers near Highgate, and soon covered the plants in the gardens, causing considerable mischief to the dahlia buds. They died, however, in two or three days, after some very heavy showers occurred. He further states that they had done great injury to the turnip crops in Yorkshire. A letter from Mr. Lister, with specimens, informed him that hundreds of acres of late sown turnips were almost destroyed by these flies. Mr. L. had five acres which were quite destroyed, and several more that were much injured.

Hitherto it has been the current opinion of naturalists that every plant had its own parasites — one or more species of plant-lice living upon it and unable to subsist upon any other member of the vegetable kingdom. Linnæus hence supposed it was unnecessary to give any descriptions of these insects, deeming that the several species were amply distinguished by simply naming the plants to which they respectively pertained. But the more accurate researches of the present day have greatly modified this view, and have shown that the same species of aphis is liable to occur upon different plants which are related to each other, and which pertain to the same botanical genus, or even to different genera of the same Natural Order. And some species occur which are still more ubiquitous, sustaining themselves upon plants which are quite dissimilar, and which pertain to different Orders. Thus the species of these parasites are now known to be much less numerous than has hitherto been supposed, many of them having received several names in consequence of their occurring upon different plants. We have a notable instance of this in the aphis now under consideration. Establishing itself and subsisting as it does upon quite a number of plants and trees which are more or less dissimilar in their nature, it has confidently been regarded as a distinct species on each of these plants and trees, and has thus received a corresponding number of names. But when we come to fully study the characters and marks which this aphis presents in each of the stages of its development, the exact form and size and colors of the different parts of its body and of each of its several members, the position of the veins in its wings, and especially the peculiar row of flocculent snow-white spots along each side of the back of its pupa, the size and shape and situation of each of these spots, we are furnished with such an assemblage of diagnostics as enables us to clearly recognize this species on whatever plant we meet with it. And, finding them to be identical in such a multitude of particulars, we shall not be able to persuade ourselves they are different species, however dissimilar the

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vegetation may be on which they occur to our notice. Mr. Francis Walker, who has investigated this family of insects so thoroughly, in his several notices of the present species (Annals of Natural History, 2d series, vol. 5, pp. 17, 73; Zoologist, vol. 6, p. 2247, and Appendix of vol. 7; and List of Homopterous Insects in the British Museum, p. 981), has shown what a number of names have been given it by different authors. And I make one addition to the list which he has given.

It was first named *Aphis Rumicis* or the dock plant-louse, by Linnæus, in his Fauna of Sweden, published in 1746. He merely states in connection with this name that it is the aphis of the *Rumex Lapathum*.

Aphis Craccæ, the next name it received, was first given by Linnæus in the tenth edition of his System of Nature, vol. 1, p. 452, published in 1758, as being the aphis of the tufted vetch, *Vicia Cracca*.

Aphis Atriplicis, the aphis of the garden orache, *Atriplex hortensis*, was the third name given by Linnæus, in 1761, in the second edition of his Fauna of Sweden.

Aphis Fabæ, the aphis of the bean, *Faba vulgaris*, appeared in 1763, in Scopoli's Entomology of Carniola, p. 139.

Aphis Genistæ, the aphis of the dyer's broom, *Genista tinctoria*, appeared in the same work with the preceding.

Aphis Acetosæ, the aphis of the field sorrel, *Rumex Acetosa*, was a fourth name given to this insect by Linnæus, in the twelfth edition of his System of Nature, vol. 2, p. 734, published in 1765.

Aphis Aparines, the aphis of the bedstraw, *Galium Aparine*, was the next name given, by Fabricius, in his Systema Entomologia, p. 735, which appeared in 1775.

Aphis Euonymi, the aphis of the spindle tree or burning bush, *Euonymus Europæus*, appeared also in the same work, p. 736.

Aphis Papaveris, the aphis of the poppy, *Papaver somniferum*, appeared in Fabricius's Genera of Insects, p. 303, published in 1777.

Aphis hortensis, on the tops of the garden orache, was published by Fabricius in his Species of Insects, vol. 2, p. 387, which appeared in 1781. He subsequently abandoned this name, becoming assured it was the same insect with *A. Atriplicis*.

Aphis Viciæ was proposed in the same work, p. 390, as a substitute for the Linnæan name *Aphis Craccæ*.

Aphis Chenopodii, the aphis of the pigweed, *Chenopodium album*, was published in 1800 by Schrank, in his Fauna Boica, vol. 2, p. 109.

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Aphis Thlaspeos, the aphis of the shepherds' purse, *Thlaspi Bursa-pastoris*, appeared in the same work, p. 118. And also *Aphis Galii scabri*, which Mr. Walker supposes to be this same species.

Aphis armata, a species named by Hausmann, was published in 1802, in Illiger's Magazine, vol. 1, p. 439.

Aphis Laburni, the aphis of the *Laburnum vulgare*, we next have, named by Kaltenbach in his Monograph of the plant-lice, p. 85. And the *Aphis Galii* and the *Aphis Euphorbiæ* of the same author Mr. Walker thinks are probably this species also.

Aphis Dahliæ, the dahlia plant-louse, described by Mosley in the Gardeners' Chronicle, in 1841, p. 628, is the last name which this insect has received to our knowledge.

We come next to notice the different kinds of vegetation which are attacked by this aphis, and the effects produced by its attacks, which are sometimes very curious. Those who have been accustomed to regard the aphides as being each a species pertaining to a particular plant or to plants which are closely related and very similar to each other, will be astonished with the number and still more with the great dissimilarity of the plants and trees on which this black aphis of the bean establishes itself and rears its broods of young.

The plant to which this insect is most injurious and which has caused it to be so much noticed, is the English or Windsor bean, one of its coarser varieties being also called the horse bean—the *Vicia Faba* of Linnæus, *Faba vulgaris* of the botanists of the present day. In our own country this bean is less cultivated now than formerly, the bush and the pole beans, *Phaseolus vulgaris* and *nanus* being so much preferred to it. Watson (American Home Garden, p. 117), assigns as one of the causes of its being so little cultivated: "If but a slight drought comes upon the plants in their growth, the black aphis will eat them up." But in European husbandry this bean is extensively grown and is a common field crop, which is frequently injured and sometimes destroyed by this insect. Dickson (Practical Agriculture, vol. 2, p. 597), says: "In such summers as are dry, beans are liable to be much injured by the attacks of the black fly, or what is often termed the dolphin, the whole field in particular cases being in danger of being destroyed in the course of a few days. It is mostly on the tops of the plants that the insect first appears." Mr. Curtis (Farm Insects, p. 355), says: "Their first appearance is very sudden, and their increase so prodigious, that crops suffer severely from their visits. In 1833 the beans were almost totally destroyed by them in Yorkshire. In 1841 they were abundant in my garden near the

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Regent's Park; but in 1842 I never saw one on the spot, yet the beans around Sandgate in the same year were very much injured by them." He further states that, having once established themselves upon the bean-tops, they breed at a rate which would be incredible, if it were not well attested, often making the bean-stalks as black as soot. They exhaust the plants by sucking the sap, so that when they abound, it is in vain to calculate upon a good crop, if they be not speedily arrested. The remedy practiced by all good cultivators, we are told, is, to cut off the tops of the plants with a scythe or other sharp implement, on the very first appearance of the insects upon them. Mr. Curtis adds to this, that these severed tops should be gathered into a heap upon one side of the field, and burned, or should be buried in a pit and trampled upon, for if they are left in the field many of the insects will crawl from them and regain the living plants. But it strikes me that if the tops of the plants are merely cut off the favorite nesting places of the insects are destroyed, so that it will be unable to settle and thrive and multiply upon the plants in its customary manner.

Several other plants of the same natural order, LEGUMINOSÆ, to which the bean pertains, are liable to be infested by this black aphis, namely, the tufted vetch and the dyer's broom, already mentioned on a preceding page, the Spanish broom *Spartium junceum*, and the black bean *Dolichos Catiang*. On the Laburnum also, *L. vulgare*, large families of this insect occur, their punctures curling and distorting the leaves of this tree in a remarkable manner.

In the order POLYGONACEÆ, the dock, as already stated, was the plant on which Linnæus first observed this aphis, and from which it has thereby obtained its scientific name. It occurs on the *Rumex acutus* and other species, and will no doubt be met with on these plants in this country. It also infests the two common species of field sorrel in Europe, and I have seen the stalks of the *Rumex Acetosella*, the common field sorrel or "red top" of this country covered with it. I suppose this to be also the aphis which sometimes invades our buckwheat, *Polygonum Fagopyrum Linn.*, *Fagopyrum esculentum* of our present botanists, completely covering particular stalks of this grain and so exhausting them of their juices that none of their kernels probably become filled. I have not been able to meet with this buckwheat aphis in my own vicinity, and only know it from specimens and statements received from correspondents. And the insects of this family are so soft and tender and so diminutive withal, that in drying they lose their colors and become so shriveled and distorted

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that, in most instances, it is impossible to identify their species from preserved specimens. The middle of September, 1866, a letter from the late Robert Howell, of Nichols, Tioga county, stated that in that vicinity many of the stalks of buckwheat were then covered with aphides, which were of different sizes, some of them having wings. Among the specimens inclosed in this letter was one of the winged lice, which closely coincides with dried specimens of the bean aphis. Yet its body, black when it came to hand, might have been green when it was alive. And it is only an inspection of living specimens that can assure us whether this buckwheat aphis really is identical with the species now under consideration.

In the order PAPAVERACEÆ, this aphis infests the opium poppy, as already noticed on a preceding page.

To some of the plants of the order CHENOPODIACEÆ it appears to be most strongly attached. Upon that common weed in our gardens and plowed fields, the pigweed, *Chenopodium album*, it has occurred to my notice very much oftener than on any other plant. During the latter part of the season a slight search anywhere will usually reveal some of these weeds infested with this aphis. The insects occur crowded compactly together and covering all the upper part of the stalks, and smaller clusters are located below, in and around the axils of the branches. Four different kinds of lice will be noticed in these clusters, namely, larvæ or young lice, wingless females, pupæ and winged females. One or two ants are quite constantly in attendance upon each flock. When frosty nights arrive, wingless females cease to be developed, and the colonies then come to be composed of pupæ and winged females, with very few young lice; and the ants then cease to be seen. The autumn rains diminish their numbers, but flocks continue to be noticed on some of the more sheltered plants till about the beginning of November, when the driving winds and storms of rain and sleet kill and wash them away. Wherever the orache potherb, *Atriplex hortensis*, is cultivated, it also is quite liable to be infested with these elfs. Mr. Curtis states that when this aphis became so immensely multiplied in July, 1847, the under side of the leaves of the beet were literally covered and black with the winged females, sticking in closely packed phalanges, and in that position they died within a few days, without killing any of the plants.

The order CRUCIFERÆ furnishes another common weed in our gardens, namely, the shepherd's purse *Thlaspi* (*Capsella*), *Bursa-pastoris*. Next to the pigweed, I have most frequently met with this insect upon this plant; and it is interesting to observe that it was on

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these same plants that this aphis attracted the particular notice of the Bavarian naturalist Schrank, seventy years ago. The stalks of this weed and the under side of its leaves may frequently be seen toward the close of the summer, coated over and black with these lice; ants also, being usually present with them. The turnip too, is sometimes attacked and greatly injured by them. The statement of Mr. Lister, that in 1854, hundreds of acres of turnips, in Yorkshire, England, were almost totally ruined by them, has been given on a previous page.

In the order Rubiaceæ, the bedstraw or cleavers, *Galium Aparine* and other species, is sometimes seen with flocks of these black lice crowded together in places upon the slender stems. Many years ago, upon the sweet, liquorice-flavored leaves of the *Galium Circæzans*, I met with an interesting aphis, an account of which may appropriately be introduced in this connection. It occupied the under side of the leaves, and by its punctures it caused each side of the leaf to turn backward, until it became doubled together, resembling a pod, with the aphides inclosed inside, as if to represent the seeds in those pods. This was in the middle of June. Later in the season, when the leaves became older and more firm and rigid they, perhaps, will cease to double together in this manner. The pupæ were but four-hundreths of an inch in length, of a dirty, yellowish-white color, with the wing-scales, the honey-tubes and the feet black. The winged lice were slightly over one-tenth of an inch in length, and black with the abdomen bright grass-green, the legs pale, with the feet and honey-tubes black. I had ticketed these specimens *Aphis Circæzandis*, a name which the species may appropriately retain, should further researches show it to be undescribed. From my notes taken at the time I met with this insect and from a re-examination of the specimens of it in my cabinet I have drawn up the following description:

Aphis Circæzandis, winged female.—Length 0.12 to the end of the wings; head and thorax black; abdomen grass-green; honey-tubes black, short, equaling but half the distance from them to the tip. Legs pallid; feet black; knees, at least the hind pair, dusky. Wings hyaline; stigma opake, salt-white; veins dark-brown, rib-vein white, third vein abortive at base a very short distance.

Wing veins.—Second vein slightly curved, twice as distant from the first vein at tip as at base, base slightly nearer the first vein than the third, tip about a third farther from the first vein than from the third. Third vein nearly or quite a fourth farther from the second vein at tip than at base, tip slightly more distant from the second vein than from the first fork. First fork at tip thrice as far from the third vein as from the second fork. Second fork very short, its tip much nearer the first fork than

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the fourth vein. Fourth vein curved, its tip a third nearer to the second fork than to the tip of the rib vein.

Variety *a*. Second vein equidistant between the first vein and the third at base and also at tip.

Variety *b*. Third vein at tip equidistant between the second vein and the first fork. Second fork at tip equidistant between the first fork and the fourth vein.

Variety *c*. Third vein emitting a branch, half way from the base of the first fork to the tip, the branch curved, approaching the first fork and then receding from it, not attaining the margin.

In the order UMBELLIFERÆ, the *Eryngium campestre* is said by Fonscolomb to be attached by the bean aphis. The parsnip, Mr. Curtis states, was attacked in July 1847, in the same manner as the beet, noticed above; the under side of the leaves were crowded and black with the winged lice. But, as they all perished within a few days, none of the plants were killed by them.

In the order CONVOLVULACEÆ, we are informed by Mr. Curtis that the underside of the leaves of the convolvuli became covered with these lice, at the time of their visitation in 1847.

In the order SOLANACEÆ, on the leaves and young shoots of the potato, this aphis settles itself, in some force at times, Mr. Curtis says; but he has never seen it on this plant in such numbers as to injure the produce.

In the order COMPOSITÆ, the dahlia is liable to have its young shoots invaded and the flower buds blasted by this insect. Among the plants mentioned by Fonscolomb (Annales Soc. Entom. de France, vol. 10, page 163), as being the residence of this aphis are the following members of this order: the burdock, the Canada thistle, the large common thistle, the star thistle *Centaurea Calcitrapa*, the yellow vegetable oyster *Tragopogon pratense*, the chamomile and marigold. He also thinks this is the species which he has observed upon the young shoots of the succory.

In the order GRAMINEÆ, Mr. Walker describes a variety of this aphis which occurs upon the manna grass *Poa* (*Glyceria*) *fluitans*, common in the wet grounds of Europe and this country.

Finally, in the order CELASTRACEÆ, an aphis has infested a thrifty young burning bush or spindle tree, *Euonymus Americanus*, growing in my yard, whereby I have enjoyed a most favorable opportunity for studying it and observing its habits the whole season through. It is clearly the species named *Aphis Euonymi*, by Fabricius, which he obtained upon the *Euonymus Europæus*, a small tree or shrub intimately related to our American spindle trees. And it is also the *Aphis Rumicis*, the insect now under consideration. I speak with

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full assurance upon this point. A comparison of this aphis upon the burning bush with that upon the pigweed shows these insects to be identical in every particular, in each of the stages of their development. Although Mr. Walker ranks them as distinct species, it will be seen that the description which he gives of *Aphis Euonymi* (List of Homopt. Ins. in British Musuem, p. 987) is the same, almost word for word, with that of *Aphis Rumicis* (ibid., p. 983).

Further researches will no doubt detect this aphis upon several other plants and trees in addition to those named above. The list now given, however, amply suffices to show how numerous are the kinds and how dissimilar are the qualities of the vegetation on which it feeds. It seems almost incredible that the same aphis should nourish itself with equal readiness upon the sharp acid juice of the sorrel, the milky and powerfully narcotic poppy, the intensely bitter chamomile, and the bland, insipid pigweed, thistle, manna grass, and other plants. It renders the suggestion of Mr. Curtis, in a quotation upon a preceding page, altogether improbable, that it in some cases is poisoned by feeding on juices not adapted to its constitution.

It was the middle of May that I first noticed this black aphis upon the burning bush. My attention was attracted to a singular phenomenon which the leaves of this shrub presented. Toward the end of almost every limb one or more of the leaves was curiously doubled backward, forming a four-sided follicle or little bag or box, each having a family of these black plant-lice inclosed therein. This folding of the leaves in this uniform and remarkable manner had been produced by the lice stationing themselves upon the midvein on the under side of the leaf, and inserting their sharp beaks into it and sucking out its juices, causing it to contract in such a manner as to form three folds or plications, extending obliquely across the leaf in the form of an italic capital letter *N*, and dividing the leaf, which is of a regular elliptic form, twice as long as wide, into four equal triangular parts. And being bent backward to a right angle at each of the three folds brought the edges of the leaf evenly together, making a four-sided box, in the form of a three-sided pyramid, with its base constituting the fourth side. These leaves were thus folded together in such an exact, such an artistic manner, as to make them quite a curiosity. If a piece of paper is cut into an elliptic shape and folded together into four equal triangular parts, it will be seen on opening it apart that the edges will come together with much exactness, to form a closed four-sided box, and will thus illustrate the operations of these insects.

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Thus each family constructs of one of the leaves a house, a four-sided room, for its residence, in which it dwells wholly hid from view, sheltered from the rains, and secure from molestation by birds or other enemies. Although there were several thousands of these black lice upon the bush, their presence would not be suspected; not one of them being anywhere visible, so effectually had they secreted themselves in their domicils.

Occupying the cavity of each of these folded leaves were a multitude of young lice, a number of pupæ, several wingless females, and usually two or three winged females which had newly acquired their wings. No winged lice except those that were newly hatched were met with. And the pupæ being so plenty, it was evident that it was their habit on acquiring wings to withdraw from the maternal roof and fly away to establish themselves elsewhere. Ants also, usually two in number, were in the cavity of each leaf.

Aware that these lice would probably very soon become so multiplied as to arrest the growth of the bush and make it puny and feeble, as they were so protected that no remedy applied to the leaves would reach them, I picked off the folded leaves, dropped them together on the ground, and trampled to death the vermin they contained, leaving only a few infested leaves from which to learn their further history.

Supposing them checked from increasing to become injurious, it was the first of June when I again went to inspect this bush and its parasites. The rapidity with which the few I had left upon the bush had multiplied, was astonishing. They no longer attempted to hide themselves by closing the leaves around them. The green succulent ends of the limbs, along their under sides, were crowded with these black lice, covering them about half way around, leaving the upper side vacant. The young leaves at the ends of these limbs were corrugated together and contracted into little tufts. The larger leaves growing farther down upon the limbs, had the midveins on their under sides occupied by numbers of the lice; and several of these leaves were either rolled or coiled and distorted; but none of them were now drawn regularly together to form a closed box or bag, as they were a fortnight before. Others of the leaves being older and of a more firm and rigid texture, were not at all wrinkled or distorted by the cluster of lice on their midveins. All the lice were fixed and stationary in one or the other of the two situations now mentioned, the under side of the young green twigs at the ends of the limbs, and the midveins on the under side of the leaves.

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The upper surface of the leaves growing below the places where clusters of these insects were located, became speckled with a white substance, which was usually in dots of different sizes; this being the honey dew ejected by the insects and falling and drying upon these lower leaves. And an aphis might sometimes be seen with a small mass of this same white substance adhering to the tip of one of its honey tubes, evidently formed by excreted honey dew which had evaporated upon the end of the tube.

Of the immense number of lice upon this bush at this time, nearly all were found to be pupæ, varying considerable in their size. Only here and there could a small young louse be found, hid or partly hid under these pupæ. Wingless females were rare, and were usually alone on the midvoin of a leaf, or with two or three young around them. Scattered among the pupæ were winged lice, all of them newly hatched. It is evident that these winged individuals all leave the bush soon after acquiring their wings.

As it was mostly pupæ that were on the bush at this time, and these were flying away as fast as they obtained wings, it is probable that within a week the bush would have been evacuated of everything except the few small young lice and wingless females. But so thronged and overburdened with these vermin as it then was, it seemed to call for instant relief. I therefore prepared a basin of strong soap suds, and, with a sponge wetted therein, I wiped the lice from the under side of a multitude of the leaves. To cleanse all the infested leaves in this manner was a task too formidable to be attempted. Where I could do so, I bent the twigs and the mass of wrinkled leaves at their ends, downward, and immersed them in the solution of soap in the basin. In other instances I let a streamlet from the sponge fall upon the tips of the twigs and run down along their under sides, so as to wet all the lice that were clustered there.

Upon examining the results of this treatment the next day, I found multitudes of the lice were killed thereby and were hanging to the twigs, suspended by their beaks inserted therein. Others had been dislodged by the streamlets, and were washed together in small masses which had lodged along the limbs. But it was only those that had been wetted that were killed. Many were lurking in the corrugated leaves at the ends of the twigs to which the soap solution did not penetrate. From these and other places where they had remained dry they were now coming, and were beginning to reoccupy the washed twigs. I had hoped that wetting the twigs and leaves with such a strong solution of soap would perhaps so infuse their surfaces with

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alkali that the lice would for a while be repelled from again locating themselves thereon; but I now saw it had no such effect.

After the check they had now received they did not again multiply to throng this bush oppressively. They continued to infest it, however, till the close of the season. The green new twigs that put forth at the end of the limbs soon grew to be too hard and woody to be adapted to their wants, and it was only on the under side of the leaves that they were met with during the summer and autumn. And the leaves were then become so firm and rigid that their punctures ceased to wrinkle or have any other perceptible effect upon them.

The center of the under side of the leaf is the point where these lice are usually stationed. Here most commonly but one or two, but sometimes six or even nine or twelve small young lice were located —foundlings, forsaken by their parents—the winged females being accustomed to alight upon a leaf and give birth to one or two young, and then fly away, but in some instances remaining until ten or twelve young are deposited. Sometimes two winged females are found on the same leaf. Much the larger portion of the young lice appear to be the offspring of winged parents. As they have occurred to my observation, wingless females are much less numerous than winged ones in this species. They are met with on the leaves with their progeny huddled closely around them. I suspect, however, that they do not place all their young upon one leaf; after a number have been deposited I think they leave them and wander away to another leaf. I once saw a wingless female travel quite a distance from a leaf on which were four young lice, but I had no assurance that these were her offspring.

In several other species of plant-lice which I have observed, the wingless females are twice as prolific as the winged ones. In each of these species the wingless females uniformly give birth to four young and the winged ones to two, in twenty-four hours. In this bean aphis the wingless appear to be little, if any more, prolific than the winged females. In June I imprisoned a wingless female and also two winged ones, during two nights and one day, at the end of which time I found three young lice with the wingless female, and five with the winged ones. But they will probably be found to be more prolific than they were in this instance.

Mr. Curtis (Farm Insects, p. 356), says: "Where the eggs are laid remains a mystery. It cannot be upon the beans, and as the apterous specimens are the precursors of the winged ones, they are not able to

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transport themselves in the first instance." As the wingless females are not able to transport themselves, it is evident that it must be by winged females that the first lice are placed upon the bean and most other plants. And there being an abundant supply of food for them on the bean tops, whereby they have no occasion for migrating elsewhere, the first generations mature into wingless females. But when the bean or other plant becomes overstocked and so crowded that there are no accommodations for any further numbers thereon, it is winged females that are developed, which will be able to fly away and find food and situations for their young elsewhere. I thus infer, from having found them all growing into winged females so early in the season as the first of June, upon the burning bush when it had become fully occupied.

Where the eggs are laid and how this insect is carried through the winter has hitherto been a mystery, as Mr. Curtis observes. Upon this important point I am able to shed some light. When examining a pigweed on which were some clusters of these black lice the latter part of October, I discovered a smooth shining egg, of a dull green color, adhering to a dry and crinkled dead leaf, and another crowded into a crevice of another dead leaf. These eggs had no doubt been quite recently placed in these situations. Later in the season I examined several other infested weeds, but was unable to find any eggs upon them. In November, meeting with a weed that was thronged with pupæ, I transplanted it into a flower pot and brought it in doors, to ascertain whether on maturing and having no other place to lay their eggs, they would stock this plant with them. But on acquiring wings they all flew away without making any deposit thereon. It was therefore evident that the two eggs which I found, were only placed on the dead leaves by accident, and that these insects do not lay their eggs upon the plants which they inhabit, or at least upon those which decay at the end of the year.

It has heretofore been shown in these Reports that the aphides do not perish on being frozen and that, in some instances at least, they survive the rigors of winter and return to life with the return of spring. And on noticing such numbers of these winged lice coming forth on the very verge of winter, and so late in the season that the inclement weather would scarcely admit of their then making a deposit of their eggs, I have been impressed with the belief that a portion of these flies would gain coverts where they would gradually become torpid from the advancing cold of the season and would be protected from injury during the winter, whereby with the return of

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spring they would revive and complete the work which they had been prevented from accomplishing in the autumn. I am thus led to think that this insect is carried through the winter both in its perfect state and in its egg state.

Since the preceding paragraphs were written I have been so fortunate as to discover the winter quarters of this insect, whereby the place and manner in which it is carried through this period of the year is no longer a mystery. And the opinion which I have above expressed, that many of the mature insects live through the winter, receives full confirmation.

Upon a mild day in December, on examining with a magnifying glass the bark and twigs of the burning bush which had been infested with this aphis during the preceding summer, I meet with its eggs in abundance. The new buds of this bush are at this time from an eighth to nearly a quarter of an inch long and are growing appressed to the bark. And it is in the crevice along each side of these buds, between them and the bark, that the female aphis places her eggs. Sometimes but one or two, at other times several eggs occur along one or both sides of a bud. They are so minute that, notwithstanding their sparkling black color, the eye is scarcely able to perceive them, except in places where several are clustered together. They lie loosely in the crevice, not fastened by any gummy substance. The buds have perhaps swollen somewhat since they were placed here, whereby they are more firmly held in their places. Their shells, or rather the soft membrane by which they are covered, is very weak and tender, so that to raise one of them out of the crevice with the point of a needle, requires to be done carefully, else it will be ruptured, a dirty watery fluid coming therefrom.

A discovery still more interesting was made in this examination. Here and there crowded under these buds a wingless aphis nearly full grown, was found, lying motionless and torpid with the cold. One of these occurred openly exposed upon the smooth bark. Apparently when it was wandering about in search of a suitable crevice into which to crowd and secrete itself, it had been overtaken by the increasing cold and became so chilled it was unable to move itself any farther, and instinctively fastened the hooks of its feet into the surface of the bark to hold itself securely thereto, as it sank to sleep. In that exposed situation the winter's storms of driving snow and sleet would probably have dislodged it, and it would have fallen to the ground and perished. But most of these aphides would undoubtedly remain secure and safe in their hiding places, through the winter,

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and with the warmth of spring will awake and return to life, and by giving birth to young will start the species for another year's operations.

Upon the cutting off of some of the twigs which they occupied and bringing them in doors, the warmth of the room immediately awakened them and they commenced walking about. They are prone to leave the twigs and wander away, and the following morning they had all disappeared. As they each showed the end of an ovipositor protruding from the tip of their bodies like a short tail, I suppose them to be adult females, contracted from their normal size by their exposure to the cold. As they differ from the summer broods in several particulars, a description of this winter variety of the females is herewith presented.

It only remains for us to describe this insect in the different forms in which it occurs to our view. As has already been stated, upon particularly noticing a swarm of these plant lice it will be seen that specimens of four different kinds occur among them, as follows: 1st, young lice, which are distinguished by their smaller size; 2d, wingless females, these being the largest individuals which are destitute of wings; 3d, pupæ, which are readily recognized by their snow-white spots; 4th, winged females, including all the specimens with wings. In addition to these, is the egg state, in which the insect passes the winter, the eggs hatching young lice, which, on growing to maturity, produce living young instead of eggs. And the young lice grow up, some into wingless females, others into pupæ, and these change into the winged females. I have never met with a male. Winged specimens which, from their smaller size or other dissimilarities, I have thought, might perhaps be males, on being observed, have invariably been found to produce young.

The EGGS are of a dull green color when newly laid, but by exposure to the light and air they gradually change till they become jet black. They are so minute that when placed upon white paper the eye merely discerns them to be black atoms that have more length than thickness. With a magnifying glass they are found to be smooth and very glossy and shining, of a regular oval form and rounded at the ends, and twice as long as thick. They measure two hundreths of an inch in length.

The LARVÆ OR YOUNG LICE vary in size and form with their age, at first having the opposite sides of the body parallel and the antennæ and legs short and clumsy. When they are grown to 0.03 or 0.04 in length they have become oval, but rather more full back of the mid-

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dle than forward of it, and are bluntly rounded at each end with the tip slightly angular. The antennæ are from a third to half as long as the body, and the legs are of corresponding length. The honey tubes are merely elevated angular points. These young lice are of a dull black color, with the antennæ and legs pale, the tips of the antennæ, the feet, knees and hind thighs usually varying from smoky to black.

A variety has the body of a grayish or lurid green color, but commonly changing to black as it approaches maturity. These green larvæ are more common in the early part of the season. And on some kinds of plants most of the young lice are of this variety.

The PUPA varies remarkably. When the insect first attains this form it is smaller and destitute of some of the most prominent characters which it subsequently presents. It is but 0.07 long, sometimes only 0.06 in length, and is of a dull sooty black color, its legs and antennæ very obscurely varied with pallid, the abdomen without any mealy-white spots, and the thorax not swollen nor abruptly widened. Indeed, it is only recognized as being a pupa at this time by the wing-scales on each side of the base of the abdomen, these being small and of a dull greenish color. The basal half of the thorax begins to become perceptibly swollen and to take on a dull green color, and white spots on each side of the back become more and more distinct, and it gradually thus acquires its complete pupa form and characters.

In its perfect pupa state it is 0.08 long, sometimes slightly over this, and is oval with the opposite sides nearly parallel, the anterior end bluntly rounded and the opposite end tapered to an obtuse attenuated point. It is slightly flattened and convex both on the back and the under side. The *head* is nearly cubical, rather more wide than long, separated from the body by a transverse deeply impressed line, the eyes projecting in form of a rounded protuberance on each side at base and occupying more than half the length. It is sooty black, sometimes dark dull green, often with the vertex slightly dusted over with a white mealy powder, imparting to it a grayish tinge. The antennæ are half as long as the body, more slender toward their tips, black, with a dull pale tinge toward their bases, which is sometimes scarcely perceptible, sometimes very distinct, and sometimes the whole of these organs are pale with only their tips black. The *thorax* is composed of two very distinct and dissimilar parts; the anterior part small, transverse, no wider than the head, sooty black, often dusted like the head with a white mealy powder; the posterior part large, twice as broad as the anterior, abruptly widened, transverse, having a peculiar swollen and blistered appearance, and being of a dull lurid greenish color, the shoulders rounded, an obtuse longitudinal impression on each side of the back dividing this part into three lobes, the lateral ones sometimes paler than the middle; the wing-sheaths appearing as oval scales, one on each side, projecting backward, appressed to each side of the abdomen and reaching about half its length, but being sometimes more sometimes less developed, black, often pale toward their bases. The *abdomen* forming about half of the total length, its tip tapering to an acute and often an acuminate point, color sooty or coal black, sutures marked by transverse impressed

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lines, honey-tubes short, reaching but half way to the tip, black; second segment with a downy or pruinose white spot on each side of the middle of the back; three next segments each with a short pruinose white band on each side of the back, the upper ends of these bands in a line with the spots on the second segment, the first and second bands contracted or almost interrupted in the middle; sixth segment often with two small faint white dots between the honey-tubes; seventh and eighth segments each with two conspicuous pruinose white spots placed at the corners of an imaginary square and in line with the upper ends of the white bands. The *legs* are pale, usually dull and obscure, with the feet black, and also the ends of the shanks, the knees and the hind and sometimes the middle thighs.

The WINGLESS FEMALES are sooty black and from 0.08 to 0.10 long and two-thirds as wide, their bodies egg-shaped, or including the head pear-shaped, the head and first segment of the thorax being narrow, their opposite sides parallel, their length and width, when taken together about equal, the head being cut off transversely in front. The antennæ are little more than half the length of the body, yellowish-white, dusky or black toward their tips, and their two short basal joints black. They are slender and tapering, seven-jointed, the two first joints short and thick, third joint longest; sixth shorter than fourth or fifth; seventh slender and double the length of the sixth. Beak black, held under the breast when not in use, its end reaching the middle pair of legs. Abdomen frequently showing pruinose whitish dots, more or less distinct, along each side of the back; honey-tubes short, scarcely half as long as the distance from their bases to the tip; tail-like ovipositor protruded frequently to half the length of the honey-tubes. Fore legs pale, yellowish-white; knees, tips of shanks and feet black. Middle legs the same, with the thighs black or smoky. Hind legs black, their shanks pale, except at the tips.

The WINGED FEMALES are black and glossy, and measure 0.08 to the end of the body and 0.16 to the tips of the closed wings. Their antennæ are half the length of the body, more slender toward their tips, black, with the basal part usually more or less pale. They are seven-jointed, the basal joint thickest and short, more broad than long, broadest at base and narrowing thence to its apex; second joint similar in length, but less thick, somewhat globular, and twice the thickness of the following joints; third joint longest of all, and rather thicker than the following; fourth but little shorter than the third; fifth little shorter than the fourth; sixth shortest of all, except the two first, of similar thickness to the two preceding joints; seventh joint long and slender, double the length and half the thickness of the sixth; these joints varying, sometimes in the same specimen. Abdomen plump oval, without spots, along each side an elevated ridge and a row of punctures; honey-tubes short, equaling but half the distance to the tip; ovipositor protruding sometimes half the the length of the honey-tubes. Legs black; shanks pale whitish, their tips black; fore thighs pale, rarely smoky; middle thighs smoky or black. Wings clear, hyaline and glassy; veins slender, black or brown, third vein abortive at its base a slight distance; rib vein pale or white; stigma opake, white, somewhat dusky; second vein rather more than twice as far from the first vein at its tip as it is at its base; third vein much farther from the second at its tip than at its base, farther from the second at base than the second is from the first, its tip a little nearer the first fork than the second vein; first fork at its tip nearer to the second fork than to the third vein; second fork at tip equidistant between the first fork and the fourth vein; fourth vein curved, its tip much nearer to the second fork than to the tip of the rib vein. Lower wings little more than half the length of the upper pair; second vein very little farther from the first at tip than it is at base, its tip equidistant between the first and the tip of the rib vein.

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Variety *a*. Second vein at base equidistant between the first and third veins. Common in Europe, very rare in America.

Var. *b*. Third vein at tip equidistant between the first fork and second vein.

Var. *c*. First fork at tip twice as far from the third vein as from the second fork.

Var. *d*. First fork at tip equidistant between the third vein and the second fork. Common in Europe, but not found as yet in America.

Var. *e*. Second fork at tip nearer to the fourth vein than to the first fork.

It will be observed that I have described the veins of the wings as they are given by Mr. Walker in a paragraph which he designates as being a variety of this species. But on the different plants and shrubs of this country upon which this aphis has occurred to my observation the venation of the wings has uniformly been after this formula; and I have never seen what Mr. Walker regards as the normal venation, except in the European specimens of this species in my cabinet. The separate items of this formula, however, have been met with in particular specimens, all except the one which I have above designated as Var. *d*.

The wingless female when hibernated to pass the winter season differs in several of its characters from its appearance at other periods of the year, as will be seen from the following description:

Variety, HIBERNATED WINGLESS FEMALE. Length 0.065. Of an elliptic form, broadest across the middle, tapering at tip to an acute point, and bluntly rounded at the forward end; flattened on the back and moderately convex, clothed throughout with scattered hairs. Color dull black, not at all glossy; back of the honey-tubes having a tinge of gray. *Head* more broad than long, nearly hemispheric in its form. Beak more thick than the forward shanks, its end reaching to the middle pair of legs, its color pale yellowish white. Antennæ not half the length of the body, very slender, not half the thickness of the legs, more slender toward their tips, habitually held curved to a semicircle, with their tips applied to the surface; pale, with the outer two-thirds of their length dull black; seven-jointed, the two first joints small, thick and short, the third joint longest, the sixth shorter than those next it, the seventh long and slender, double the length of the sixth; these organs variable in the details of their structure, the two sides frequently differing in the same individual. *Thorax* widening backward, an impressed line across its middle marking the suture whereby the back is divided into two segments. *Abdomen* with faint transverse impressed lines visible in places, imperfectly marking the sutures; each side elevated into a rounded ridge, with a row of punctures commonly visible in the groove along the inner side of this ridge. Honey-tubes short, their length less than half the distance from them to the tip. End of the ovipositor slightly protruded and resembling a short tail little longer than thick. *Legs* pale, glossy, dirty yellowish white varying to dirty olive their whole length; four forward shanks more slender than their thighs; hind shanks thicker and longer than the hind thighs. Feet extremely slender and short, blackish; when highly magnified found to be a third the thickness of the anterior shanks, and appearing to be formed of a single joint which is four times as long as thick, slightly narrowed at its base and at its tip furnished with a pair of hooks.

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BLACK-LINED PLANT-BUG, *Phytocoris lineatus*, Fab. (Hemiptera. Capsidæ.)

In June, freckling with rusty yellow spots the leaves of the currant, weigelia and other shrubs, and withering by their punctures the flower-buds of the dahlia, rose and other plants; an oblong bright lemon yellow bug three-tenths of an inch in length and marked with four black stripes.

The latter part of May and in June, two or three contiguous leaves of the currant, the weigelia and several other shrubs and plants may frequently be noticed with several small blackish spots, looking very much as though they had been spattered with drops of pale ink which has become dried upon them. It is usually some of the more tender young leaves at or near the ends of the stalks which are thus freckled. The spots which appear earliest in the season are small, mere dots of an irregular roundish form. Those which are made at a later date are longer, nearly or quite one-tenth of an inch across. When the leaf is held up between the eye and the light these spots are found to be semi-transparent, and a close inspection shows that they are caused by the opake green pulp or parenchyma of the leaf having been removed, only a slight stain of green remaining on the transparent skin of the upper side of the leaf.

When they are two or three days old these spots become changed to a yellow or brownish yellow color, the leaves then appearing as though they were struck with rust (parasitic fungi of the genus *Uredo* or *Æcidium*) or some similar disease. They are now much more conspicuous and more apt to be noticed than when they first appear. And those parts of the leaf where they are most dense, after some days become dead, dry and brittle; and in the end, by the winds rustling the leaves together and violence from other causes, these dead portions become broken away, making ragged holes in the leaves or notches in their sides.

Newly made blackish spots continue to appear, day after day, interspersed among the yellow ones where they are not dense, or upon the contiguous leaves one after another, until frequently several leaves become thus freckled. On searching for the cause of this mischief, upon the under side of a leaf on which the blackish spots occur, there will usually be found a small glossy bug of a tawny yellow and black color, in the fore part of June, or later in the season a larger pale yellow bug striped with black. It quietly resides upon the under side of the leaf where it is hid from view, nourishing itself by inserting the point of its sharp needle-like beak into the leaf and sucking the soft juicy pulp from each cell which it punctures, thus producing

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the spots, which appear alike upon the upper and under surfaces of the leaf. It would be thought there were one or more insects upon each leaf, to make such a multitude of these discolored spots, but ordinarily, though three, four or more leaves in a place are affected, only one insect is found, rendering it evident that he has passed from one leaf to another and that all the mischief has been done by him alone. Each leaf is punctured some hundreds of times, the spots being in places so close together that they run into each other, though over most of the surface they are slightly separated.

Some years these bugs become much more numerous than usual, and then, instead of being scattered about singly, they become gregarious, gathering together in flocks upon particular plants or masses of vegetation, injuring by their punctures nearly all the leaves and quite destroying many of them.

But its attacks are not limited to the leaves. It is prone to also fall upon the flower buds of some of our choicest flowering plants. To these it is most pernicious, causing the buds to wither and die. It is in this way that this bug does the greatest damage. Its punctures are so fatal to the flower buds and they perish so speedily that many persons suppose the buds to be poisoned by its stings.

The dahlia (*Dahlia variabilis* and *coccinea* in all their varieties) appears to be the plant to which this bug is most strongly attached, and to which it does the greatest injury. Upon the dahlias in my own grounds some of them have frequently occurred; but whenever one has been noticed it has been picked off and destroyed if it did not elude capture; and as they have never been numerous with me I am unable to speak from personal observation of the manner in which this plant is injured by them. In the year 1858, I learned from A. F. Chatfield, the florist in Albany, that upon all his dahlia plants that year, when the first flower bud put out these bugs assembled upon it, puncturing and poisoning it so that it withered. Two or three new flower stalks would then shoot forth from the base of this one, the buds on which would be attacked and destroyed in the same manner. Others would then put out from the bases of these, to share the same fate. Thus it went on, the whole season through. An enormously broad mass of leaves and stalks, fully three feet in diameter, thus grew from each of the dahlia roots in his garden, without a single flower from all the multitude of flower buds which had thus been developed. D. F. Heffron, of Utica, informed me that in the summer of 1864, these prettily striped yellow bugs so infested his dahlias that only three or four little imperfect flowers were produced. And

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in all the gardens in and around Utica that year, the flower buds were so universally killed by this insect that no dahlias were there to be had. Other instances, of similar purport, might be cited; these, however, amply suffice to show how extremely pernicious this bug is liable to be, to this favorite flowering plant.

Upon the rose I have met with this insect, puncturing the flower buds and causing them to perish. Other plants which put forth their flowers in June and July it will no doubt be found to attack in the same manner.

On passing along a row of currant bushes, in the month of June, two or three contiguous leaves will here and there be noticed, freckled with yellow spots, and having one of these bugs secreted upon their under side. But I have never known them to invade the currant in sufficient force to occasion any appreciable injury.

To the weigelia it appears to be much more attached and more pernicious, sometimes ruining the foliage of this beautiful flowering shrub. This present season (1870), a weigelia growing in the Evergreen Cemetery, Salem, N. Y., so early as the second week in June, was so thronged with these bugs that scarcely a leaf remained which was not freckled with rusty yellow spots, and many of them were wholly destroyed. At the end of the month nearly all of these insects had been obliged to leave this shrub, its foliage being dry and dead to such an extent that they were no longer able to nourish themselves thereon. A few yards distant was another of these shrubs which remained green and thrifty, with very few of its leaves discolored with spots from the punctures of this bug. Why did one of these shrubs remain unharmed when the other was so badly injured? The only cause to which I could impute this difference, was, that the former was growing in the shade of other bushes and trees, whilst the latter was openly exposed to the sun. And it would hence appear that vegetation which is growing in the sunshine is much more liable to be injured by this bug than in shaded situations.

On the bittersweet or henbane, *Solanum Dulcamara*, I have also known it to occur in such numbers as to destroy a portion of the leaves. On this shrub the spots are of a grey color, which its punctures produce on the leaves. I once found it quite numerous upon a patch of tansy. In one or more instances I have also met with it, freckling with its punctures the leaves of the plantain, soapwort, snapdragon, sumach and burning bush.

Upon the green succulent ends of thrifty stalks of the raspberry I have sometimes noticed blackish spots, identical in their appearance

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with those made upon leaves by this bug. These spots, in some instances, have extended along the stalk the length of a foot or more. No insect has been present when I have discovered these spots, but I have supposed they were caused by the punctures of this bug.

Though I have not met with it in its winter quarters, it is evidently in its perfect state, that it passes this period of the year, secreted probably among fallen leaves, or under pieces of boards lying on the ground, in crevices, and other situations where it will remain dry. Coming forth upon the opening of spring, it no doubt lays its eggs upon the young stalks of the dahlia and other vegetation on which the immature bugs afterward appear. These, during the larva state, are so small and their punctures are so slight that they are not noticed. It is not till they have grown into their pupa state the latter part of May, that their wounds begin to freckle the leaves so plainly with spots that they attract observation. The bug is then about three-twentieths of an inch in length and of a flattened oval form and a shining tawny yellow color, the hue of beeswax, varied in places with black, white and lemon yellow. Its size, colors and several other characters are so dissimilar to those of the adult insect that we give a full description of it.

The PUPA is 0.15 long and half as wide, flattened and of a regular oval form, its sides evenly arched, its surface smooth and shining, of a bright tawny yellow color. The *head* is rather small, broader than the anterior end of the thorax, transverse, oval. Viewed in front it is triangular, its lower angle with an elevated polished coal black nose, ending in a tapering four-jointed trunk which is held backward under the breast, reaching nearly to the base of the middle pair of legs, and is of a pale watery color with its tip black. The eyes occupy each side of the head and are smallish, protuberant, egg-shaped, black-brown. The antennæ are two-thirds the length of the body, clothed with fine short inclined hairs, tapering, four-jointed, black; the basal joint pale, shortest and thickest; second joint longest, nearly thrice the length of the first; fourth joint scarcely half the length of third. The *thorax* is thrice as broad as long and strongly narrowed from its base to its apex, its hind angles rounded, each side raised into a thin outer edge; its color tawny yellow faintly bordered with white on the anterior edge and with a faint white stripe in the middle, its basal third white with a large black spot on each side of the middle and a small oblong spot on the outer angle, this latter being sometimes diminished to a short black line. The *abdomen* is tawny yellow with a faint lemon yellow line along the middle and two rows of faint yellow dots on each side and two large black dots at the tip. On the under side it is tawny yellow with a black spot at the tip which is notched or forked at its anterior end. In the males the abdomen is orange red, and on each segment is a broad black band occupying the anterior half of its length and ending at the outer row of pale yellow dots. The *wing-sheaths* reach half the length of the abdomen and are black and polished, with a broad lemon yellow stripe between them, and a white stripe on the middle of each, which does not reach the tip. The *legs* are obscure watery whitish, with two dusky bands near the tips of the thighs, the hind thighs having also a black stripe on their front side at the base.

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One after another of these bugs changes from its pupa to its perfect state upon different days in the fore part of June. Among a large number found on the eleventh day of this month, only one was remaining in its pupa state. With this change they are abruptly increased to double their previous size, now measuring a quarter of an inch in length to the end of the body and three-tenths of an inch to the tips of the wing covers. Their colors are also more bright and different from those of the pupæ. It is a pretty insect, being, when newly captured, of a bright grass green or apple green color, with the head and neck orange and four stripes on the thorax and wing covers jet black. In drying, specimens lose their green color and become bright lemon yellow. The females are much more numerous than the males, and their colors incline to be paler and their stripes and other black markings smaller.

This bug is of an oval form much more than twice as long as wide, flattened, moderately convex both on the back and the under side, with the surface on the upper side smooth and shining and destitute of any hairiness.

The *head* is small, more broad than the anterior end of the thorax, but scarcely half as wide as its broadest part, four times as broad as long. Viewed in front it is triangular. In the male it is orange red, in the female orange yellow. The nose is represented by an elevated oblong black spot, to the lower end of which the beak or trunk is joined. This reaches slightly beyond the base of the first pair of legs. It is tapering, four-jointed, orange yellow, the first joint black in front, the second joint black on the sides, and the last half of the fourth joint black. The eyes occupy the outer corners of the head, and are smallish, protuberant, oval, and blackish brown. The antennæ almost equal the body in length. They are slender, tapering, bearded with fine, short, inclined hairs, black, with their basal part pale yellow. They are four-jointed, the first joint thickest and slightly longer than the width of the head, thicker toward its tip, its surface glossy and uneven; second joint more slender than the first and double its length, scarcely thicker in and beyond its middle than toward its base; third and fourth joints quite slender and thread-like, the third rather longer than the first, the fourth but half the length of the third.

The *thorax* is more broad than long, its sides straight and strongly converging, its base twice as broad as its apex, the basal edge straight in the middle and curving forward on each side with the outer corners bluntly rounded; the apex margined by a roundly elevated line of a lemon yellow color, the surface convex and inclining obliquely downward and forward. Across its anterior third it is roundly elevated, smooth and polished, and of the same color as the head, this elevation having on its anterior face near the middle two shallow punctures, and commonly a similar puncture on each shoulder; and in the middle of its hind edge is a slight depression in which two shallow punctures close together may usually be seen. The remainder of the surface is minutely punctured and lemon yellow, with four black stripes, which are larger in the males, the middle ones often as broad as long, more broad than the space between them, widening backward and almost twice as broad at their hind as at their fore ends, with their hind ends slenderly separated from the hind edge; the outer stripes slender and more than four times as long as broad, separated from the outer edge by a slender yellow line, and the space between them and the inner stripes

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nearly as wide as that between the latter. The scutel is large, triangular, lemon yellow, sometimes orange in the males, its outer angles black, this color thus connecting the middle stripes of the thorax with those of the wing covers.

The *wing covers* at their base equal the thorax in width, and become slightly wider across their middle. They are of a leathery texture with the hind ends thin and membranous. The leathery portion is bright lemon yellow, minutely and irregularly punctured, ending in a triangular piece which is separated by a transverse suture. On each wing cover are two black stripes, continuous with those upon the thorax. Outer stripe commencing as a slender point on the anterior end of the outer margin, gradually widening and receding nearly half its width from the margin as it extends backward, its rounded hind end commonly touching the transverse suture, and beyond this is a large black dot, upon the triangular piece slightly forward of its center. The inner stripe is usually broader than it is on the thorax, as is also the space between it and the outer stripe, whilst between it and its fellow the space is narrower here than on the thorax and scutel. The membranous ends of the wing covers are black and united with the hind ends of the middle stripes, and the outer end of their curved vein is pale yellowish in the females. The wings are smoky black and translucent, with opake black veins.

The *under side* is orange yellow, in the male red, and without spots or marks in some specimens whilst others have a black dot on each side of the breast, a black spot on the end of the body, and sometimes forward of this spot is a short band on each segment.

The *legs* are long and slender, the hind pair much longer than the others and their thighs thicker. They are dull yellowish white, translucent and glossy. The thighs are long, cylindrical and bearded with fine short hairs and along their under sides a few longer ones. Toward their tips are two black bands which are sometimes united more or less, the upper band commonly broader, and on the four forward legs both bands extending but half way around. The trochanters or small smooth lobes on the base of the thighs are frequently black, and the fore thighs sometimes have an oblong black spot or cloud immediately below the trochanters. Hind thighs usually with a black line on their outer side, extending their whole length above the bands. The shanks are a third longer and much more slender than the thighs, cylindrical, bearded with small black spines, their tips black and a short black line on their outer side below the knee. The feet are more slender than the shanks and are three-jointed, the two first joints little longer than thick, the last joint nearly as long as both the preceding, and black except at its base, with a pair of brown claws at its tip.

Varieties, *a*. The outer black stripe on the thorax wanting.

b. The black dot at the end of the outer stripe on the wing covers wanting.

c. The black bands above the knees wholly wanting, or replaced by one or two dots on the outer and inner sides of the hind pair.

These bugs are extremely shy and constantly on the alert to escape notice. When approached they quickly and adroitly slip around the edge of the leaf to its opposite side, where they will be hid from view. Thus on coming to a mass of shrubbery on which there are hundreds of them, their presence will not be suspected, not one of them being anywhere visible. But upon bending a stalk aside so as to bring the other surface of its leaves into view, here and there one of them will be seen, standing quietly on its

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leaf with a look of perfect innocence and as if unconscious of any guile or deceit; yet watching its opportunity to do so unobserved, it again expertly dodges around to the back side of the leaf. If the hand approaches to seize it, it quickly drops itself down among the foliage beneath. Or if one hand is held under the leaf, whereby it in dropping falls into it and the fingers are closed upon it, ere one is aware, it slips out at some opening between them and falls among the leaves or into the grass. It does not incline to take wing except as a dernier resort. By its long, stout hind legs it is adapted for skipping; and its mode of progression is quite singular. It walks briskly a few steps and then gives a skip, throwing itself two or three inches, and it then pauses and looks around, apparently to see if anything has noticed and is following it. It then walks a few steps further and gives another skip and again stops and looks back; being evidently aware that when it is moving it is much more liable to be seen by some enemy then when it is standing still.

These bugs which we meet with grown to maturity and paired in the middle of June, lay a crop of eggs from which another generation completes its growth before the end of the season. Thus there are two generations annually.

This insect having only a single strongly curved vein in the membranous ends of its wing covers, and the two last joints of its long four-jointed antennæ very slender, will pertain to the family Capsidæ in the order Hemiptera. And as the second joint of its antennæ is cylindrical and not thickened toward its tip, and the fourth joint is notably shorter than the third it will belong to the genus *Phytocoris*.

It is undoubtedly the species which Mr. Say describes under the name *Capsus 4-vittatus* at page 20 of his pamphlet on the Heteropterous Hemiptera, published at New Harmony, Ia., 1832, and republished in Trans. N. Y. State Ag. Soc. for 1857, p. 784. We notice his description is taken from a female specimen, and is erroneous in saying that the black dot at the end of the exterior stripe is annulated or inclosed in a ring of a different color. He also says the lateral stripes on the thorax are marginal. But the thorax shows a yellow edge along the outer side of these stripes; they, therefore, in strictness, are not marginal but sub-marginal.

Mr. Say closes his observations on this species with the query, Can this be Lygaeus lineatus, F. Syst. Rhyng., p. 234? This is an important point to be determined. Fabricius, in the work cited, defines the *lineatus* to be ferruginous, or in other words, rusty yellow

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or tawny, the thorax and wing covers yellow, lined with black, and inhabiting North America. This coincides so closely with our insect that we know not why Mr. Say doubted its being this species, unless it be that the black marks are too broad to be termed lines. But was not Mr. Say aware that Fabricius is by no means exact in limiting this term to slender marks? And in this insect the outer mark through most of its length is frequently so slender as to be a line rather than a vitta or stripe. For a more particular description of the *linéatus* Fabricius refers to a previous work of his, the supplementary volume of his Entomologia Systematica, p. 541, where he first named this species. We there meet with a description quite as full and exact as that given by Mr. Say, and to the same purport in almost every respect. We notice two or three phrases, however, which might render it doubtful whether our insect is the species referred to. We are told the *lineatus* is the exact size of the *campestris*. Specimens of the latter in my collection, received from Prof. Boheman of Sweden, are smaller than our insect. But Zetterstedt, Ins. Lapp., p. 273, and others, have remarked, what is also very obvious from the characters assigned to the *campestris* by Fabricius, that his insect can scarcely be the same with that to which Linnæus gave this name. It is therefore uncertain what species it is to which Fabricius refers. Again, we are told the scutel is black at its base. This is not strictly correct; it is black only on each side of its base and not in the middle. Such slight inaccuracies as this, however, are not uncommon in the old authors. In this case, moreover, the base of the scutel may have been obscured by the manner in which the specimen was pinned.

We come, finally, to notice a much more important discrepancy. This occurs in the opening of the description, the first clause of which, translated, reads: "Head black, antennæ ferruginous." To coincide with our insect this should be, "head ferruginous, antennæ black." As the remainder of the description so accurately applies to our insect, the query at once suggests itself, is there not here a clerical error? In copying this first clause have not the terms been inadvertently transposed? We of course are obliged to take the description as it stands, unless we have satisfactory evidence that it is erroneous. But how is it possible for us to know if there is such an error as we have suggested? Obviously a reference to the specimen from which Fabricius drew this description would conclusively settle this point. We are informed he met with this and some half dozen other North American insects

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which were new to him, in the collection of Mr. Herschel.* We know not whether those specimens are still preserved, whereby it will be possible to conclusively determine the point in question. Is there any other mode in which it is possible for us to obtain light upon this subject? We observe that in the phrase "head ferruginous antennæ black," the terms head and black impress the mind more strongly than the terms antennæ and ferruginous, and thus there is a tendency to bring them together. We also observe that this great master of our science, Fabricius, was by no means so careful and exact that we can confide in the descriptions he has left us as being always accurate and free from errors. Of this inadvertency we are at present forcibly reminded, from a fruitless endeavor to ascertain the correct orthography of the person's name in whose collection he met with this insect. Upon glancing through the Ent. Syst. suppl. and the Syst. Eleut. we meet with this name in sixteen instances, and find it given as Hirshel, Hirshell, Hirschel, Herschel and Herschell, it occurring five times under the first and five times under the fourth form. And now, when we come to attentively consider the characters which are assigned to *lineatus*, we shall discover them to be so contradictory as to render it evident there is an error in the description. As already stated, the species is first briefly defined as ferruginous, with the thorax and wing covers yellow lined with black. We are next informed that the head is black. Thus we are told that the head is black, the thorax and wing covers yellow, and yet the predominant color is ferruginous. The latter statement is obviously inconsistent with the former. We find further, that the only parts mentioned as being ferruginous are the antennæ, the anterior part of the thorax and the body on its under side. If we paint a specimen of our insect with the head black and the antennæ rusty yellow, whereby it fully meets the details of this description, the ferruginous anterior border of the thorax becomes so inconspicuous that it is only noticed upon a

*We notice that one of these is named *Cicindela obscura*. This species of Fabricius appears to have been overlooked by recent writers. From the short definition of it in the Syst. Eleut. 1, 238, Mr. Say supposed it to be the species which is now currently known as the *C. modesta* of Beauvois. But the original description, Ent. Syst. suppl. p. 61, informs us that the *obscura* corresponds in size with *C. Germanica*. Specimens of the latter insect now before me are much smaller than the *modesta*. We are also told that of the two white marginal points, the anterior one is on the base of the wing covers, whereas in *modesta* it is on the outer margin near the base. Thus the species which Mr. Say describes as the *obscura* is clearly a different insect from that to which Fabricius gave this name. What is stated of the latter as to size, color, position of the white points and the lunule at the tip, coincides with none of our Cicindelas except some varieties of the *punctulata* of Olivier. This species is described by Fabricius in this same connection, under the name *micans*, of which he remarks, it is exactly the size of *obscura*, of which it is perhaps a mere variety. It thus becomes quite evident that the *obscura* of Fabricius is nothing but one of the black varieties of *punctulata* in which the white points on the wing covers are mostly effaced.

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close inspection, and I think no one in describing such a specimen would give its ground color as ferruginous; it would be termed yellow or black. The thorax and wing covers being yellow it is evident the head with the under side must be ferruginous to render this the predominant color.

Finally, when we further take into consideration the facts that this is a common species throughout the United States, and that it is a pretty insect, which an amateur collector would take special pains to secure, it is altogether improbable it would be overlooked and another insect be found almost identical with it but so extremely rare that it has never been met with in our day.

In view of all the circumstances, therefore, we think it cannot be doubted that this is the insect which Fabricious had in his view.

We have been induced to state thus fully the grounds on which we are led to adopt the Fabrician name for this insect, deeming they will settle a subject which would otherwise remain in doubt. From this discussion the general reader will perceive how embarrassing it is and what an amount of research is often required, to determine the legitimate scientific names in natural history.

As respects remedies for this bug, the probable efficacy of shading infested plants and shrubs from the sun has already been mentioned. Hand-picking is the only other measure which we have to notice. Most of these bugs will elude capture by dropping from the leaves and secreting themselves among the vegetation on the surface of the ground. But, so timorous and shy as they are, if they are daily searched for and routed from their quarters, it is probable they will soon forsake the situations in which they find they are so frequently disturbed.

LILAC MEASURE-WORM, *Priocycla Armataria*, H. Schœffer. (Lepidoptera. Geometridæ.)

In September, eating the leaves of the lilac by night, and by day hanging from the twigs with their heads downward; a slender humpy ten-footed dark brown worm over an inch long, with three bright yellow spots on each side of the hind part of the body; passing the winter in a cocoon under fallen leaves and rubbish, from which the last of June comes a pale rusty brown moth, with scalloped wings, an inch and a quarter across when extended, both pairs having a dark tawny yellow band across their middle, and their underside bright orange, crossed by a blackish brown line.

An interesting insect of our State, a delicate miller or moth, pertaining to the Ennomos group, in the family Geometridæ, which had escaped observation until our own day, is found on examination to be so different from all the species akin to it, that it constitutes the type

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of a distinct genus, of which genus itself is as yet the only known member. Occupying a position of such prominence, it becomes important to know the measure-worm from which this moth is produced, wherefrom to acertain the characteristics of the caterpillar or larva state of this genus. I find this measure-worm to be of a peculiar type, differing prominently in its structure and other characters from all the larvæ which are known in the genera related to it. It thus, equally with the perfect insect, justifies the separation of this species as a distinct genus. The singular habits of this worm, moreover, will render an account of it interesting alike to the general reader and the student in science.

We meet with this measure-worm feeding upon the leaves of the lilac. But as it is a native insect of our continent and the lilac was introduced here from abroad, it will undoubtedly occur upon the ash or some other one or more of our indiginous trees or shrubs which are nearly related to the lilac.

In the first period of their lives the small young worms are of a slender cylindrical form, and of a dark liver brown color, with shining black heads, which are of the same thickness as the body. The mouth is white, and on the body are four white bands, which with a magnifying glass are found to be composed of short white lines placed upon the sutures side by side and lengthwise of the body. They have three pairs of legs placed upon the breast, a pair of thick prolegs at the end of the body and a second pair a little forward of these last; and on each side of the back the three or four middle segments each show a small tooth-like protuberance projecting horizontally outward.

The young worms eat small holes through the leaves, mostly along each side of the mid-vein. And when not engaged in feeding they all station themselves upon the underside of two or three contiguous leaves, where, clinging with their hind feet, the hang downward in a grotesque posture, having the middle of their bodies bent into a half circle with the two ends remaining straight. They continue for hours stiff and motionless in this position, hanging downward perpendicularly, with here and there one it may be, holding itself in an oblique direction. They do not feed upon rainy days, and then remain in this posture, fastened to the under surface of the leaves the whole day through.

When they are grown to a larger size and have shed their skins they are considerably changed in their appearance. They are then of a sooty brown color with three very bright yellow spots on each

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side of the hind part of the body, these spots being such a peculiar mark and showing so conspicuously upon the dark ground color of the body that the eye notices them much more than any other character pertaining to these worms. Some spots and lines of a whitish color are seen here and there, and the surface is also observed to be uneven, from little conical humps which project out at different points, four of these in a row on each side of the back being the most conspicuous. It will also be noticed that they vary in color, some being less dark than others. Even the same specimen frequently varies in a short time in its hue and in the distinctness of its whitish markings.

A more full description of these worms here follows:

The LARVA grows to nearly an inch and a quarter in length, and is slender and nearly cylindrical, with short bristles scattered over its surface. It varies in color from umber brown to dark sooty brown, with ash gray and cream yellow markings. In the middle of its body on each side of the back are four obtuse, conical humps, placed on the fourth and three following rings, the two middle ones being larger. These dorsal humps project horizontally outward, rendering the back flattish and imparting to it a serrated appearance along each side. Beneath upon each side are humps which are more obtuse, resembling retracted prolegs, each of these ventral humps frequently having a sooty black cloud upon its anterior side. Upon the last segment are two conical tubercles, their tips often black and yielding a short bristle. Upon the outer base of these tubercles is a small oval spot or short streak of a cream yellow color; and posteriorly along each side of the back is a row of small, cream yellow dots, one on each segment, the last dot being quite near the hind end of the small oval spot. On the back of the fourth and following rings are similar dots placed near each other, upon the anterior bases of the dorsal humps. And along the middle of the back is a row of ash gray marks having the form of an inverted letter V, their hind ends terminating at the cream-colored dots; the two anterior of these marks, occupying the top of the fifth and sixth rings, being more expanded, irregular and cloud-like. Each of the four prolegs has an ash gray or pale reddish stripe upon its outer face. The stripe upon the anterior pair of prolegs is prolonged obliquely upward and forward, into an irregular triangular spot of a bright cream yellow color. And upon the two segments next forward of this are similar spots, but successively smaller, the anterior one being usually a mere cluster of small spots and dots irregularly connected together. Beneath, along the middle is an ash gray line, faintly margined on each side with darker sooty brown, this line not being prolonged upon the breast nor reaching the tip. On each side of the neck immediately below the breathing pores is a slender, irregular whitish line. The head has the same color with the body and is frequently mottled more or less with ash gray.

After the young worms have changed their skins and taken on the markings above described, they become much altered in their habits. They now eat the whole of the leaf instead of nibbling small holes through it. And one of the first things we observe respecting its feeding, is, that whilst it is a common habit of the leaf-eating caterpillars and other larvæ to take only the more tender parts of the

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leaf and pass by the coarse woody midvein and the coarser veins which branch from it, although the leaves of the lilac are so firm and leathery in their texture, this measure-worm consumes the entire leaf, including the midvein and its branches, leaving only a stump of the green leaf-stem.

We notice it as another singular habit of this worm, that, whilst most other worms endeavor to hide themselves from view, and do their work as much as possible where their operations are concealed and least liable to attract observation, this worm selects the most exposed situation it can find and places itself where it will be conspicuously in view. The whole company of these worms move away from their first location and take up their residence together, upon one of the most projecting branches of the lilac bush. Here, feeding in the night time and remaining at rest during the day, they begin at the outer end of the limb and wholly strip it of its leaves, advancing farther and farther along from night to night. But instead of remaining to repose during the day where they have last been feeding, and where the foliage would aid in secreting them from view, they crawl back to that part of the branch which has been entirely denuded of its leaves, and where they will be most openly exposed, and there suspend themselves, clinging with their hind feet to the stumpy leaf-stalks and the small twigs, and hanging perpendicularly with their heads downward. And they now present a very singular and interesting instance of that imitation of other objects which is so common among the creatures of this class.

This faculty of mimicking other things, with which so many insects are endowed, is certainly one of the most curious and wonderful phenomena in nature; this habit which they have, some in their larva, others in their perfect state, to place themselves in such situations and form themselves into such shapes as to appear like some other object in nature, to which they in reality have no relationship, no affinity whatever, and an object, frequently, which no one of their race has ever seen and cannot therefore be supposed to know that any such object has ever existed. The design of this counterfeiting of other objects undoubtedly is to protect them from being noticed and destroyed by their greatest enemies, the birds. This is evident from the fact that the object which is imitated is always something to which birds will have a repugnance or to which they will be wholly indifferent. Among the multitude of things which are mimicked we never meet with a berry, a seed-pod or any other object which will be attractive to a bird. And it is truly one of the most beautiful arrange

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ments of nature, whereby creatures which have no means of defense, usually no power to spring or fly or other resort whereby to escape from their enemies, are able to take on such an appearance as will cause them to be overlooked and passed by unharmed. But for this they would soon be exterminated.

It is most frequently some of the common parts or appendages of shrubs and trees which are imitated. Different kinds of small insects are accustomed to station themselves in the axils at the base of the leaf-stalks, where they appear like the buds growing at these points. The larvæ of the different lappet-moths so closely resemble the bark of the trees on which they respectively feed, as to be quite invisible when they are at rest. Many of the measure-worms have a habit which most persons have noticed. Fixing themselves to a limb by their hind pair of feet, they hold their bodies outward therefrom, straight and stiff, remaining motionless in this position for many hours, their slender cylindrical form and dull colors giving them a most perfect resemblance to a dead twig branching from the limb. Without adverting to other instances of this mimicry we return to this lilac measure-worm, and remark that in its young state, when suspended from the under side of a leaf with the middle of its body bent into a semi-circle, it is *sui generis* in its appearance, looking like no other object in nature with which I am acquainted, and the cluster not in the least resembling an assemblage of worms. But when it is grown to a larger size and the whole family is hanging suspended from the twigs of a leafless limb, they present a counterfeit which is so perfect and striking that it is at once recognized. They then have the exact aspect of the brown aments or unopened staminate flowers of the alder, the poplar and other analogous trees which put forth their flowers in early spring when the limbs are destitute of leaves. Whoever is familiar with the appearance of these pendant tassels as they occur upon the alders growing along our streams of water will at a first glance be struck with the close resemblance of these lilac worms to them. The similitude will be noticed in all their details; their size, their form, their position, their brown color, the projecting teeth along the sides of their backs appearing as the ends of the opening scales of the aments, and to crown all, the three bright yellow spots upon each side of the worms are a perfect counterfeit of some of the yellow anthers of the flowers beginning to protrude from between the scales. And we further observe that a portion of the aments of the alder grow in pairs, and in a company of these worms hanging from the twigs and leaf-stalks, here and there two will be

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seen suspended from the end of the same stalk or from the opposite sides of a twig. In thus imitating these tassels of the immature flowers of the alder so perfectly in such a number of particulars, what a remarkable display of instinct does this worm present!

If the bush in which they are suspended be jarred or they are otherwise alarmed they draw themselves upward, bending their bodies into angular shapes.

The worms continue to feed six or eight weeks, coming to their full size about the middle of September. They then descend from the bush and crawl under fallen leaves or other rubbish, and there spin around themselves a network of threads with open meshes, to the outer surface of which, small pebbles, loose lumps of dirt and fragments of leaves are fastened; and in this slight cocoon it takes on its pupa form.

The pupa is closely invested by the cocoon, which is oval, half an inch long and 0.20 thick. The pupa is chestnut red, its rings densely and confluently punctured, all the posterior ones having a broad smooth hind border. The wing-sheaths are minutely wrinkled and rugose from short, irregular, strongly impressed lines, those around the border being more even, parallel and at right angles to the edge. The tip terminates in two slender black thorn-like spines, which are hooked at their ends.

The insect lies dormant, inclosed in its cocoon during nine months of the year. It begins to come abroad in its perfect form upon the last days of June, new individuals continuing to hatch and come forth until the middle of July. Upon the same night on which they issue from their cocoons the sexes pair, and the female deposits her eggs upon the following day. They are probably laid in a cluster, glued upon the under side of a leaf of the lilac. Seventy-five eggs were counted that had been deposited by one female.

The eggs are smooth and glossy, of a short, cylindrical form, with rounded ends. They are 0.025 long and two-thirds as thick. They vary remarkably in their color, being at first pale bluish or yellowish green and changing in a day or two to pale reddish. This color gradually deepens to coral red, bright and shining. They then grow darker, and just before hatching are deep liver brown. They hatch two weeks after they are laid. The evacuated shells are white and translucent.

The MOTH or miller varies in width across its extended wings from 1.25 to 1.35, the larger specimens being females. The *head* is more than twice as broad as long, the large, protuberant eyes occupying each side and constituting more than half its total width. It is covered with rusty, yellowish scales. The palpi or feelers project out

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from the flattened front and are held apart. They are straight and strongly compressed, with loose scales at the base, those of the second joint being smoothly appressed to its surface; third joint distinct but small; little longer than thick, cylindric-conic, its apex bluntly rounded. The spiral trunk is more than half the length of the antennæ. The antennæ are more than half the length of the body, and of a wood brown color. In the males they are pectinated, having two rows of longish branches which are directed downward and are curved, their tips approaching each other and ending in a fine short bristle. These branches are minutely ciliated and gradually diminish in length, the ten last joints being merely toothed like a saw, each tooth tipped with a fine bristle. In the female these organs are simple, thread-like, more slender toward their tips, with two rows of fine bristles along the under side. The *thorax* is broad oval, but little longer than thick, and is clothed with scales, and along each side with hairs of a rusty yellowish color. The *abdomen* is cylindric, reaching the inner angle of the wings in the dried specimen, longer when alive. It is pale brown, often with a dark brown band on the hind edge of each segment. It is narrowed at its tip and ends in a circular fringe of brown hairs inside of which, in the males, are two valves which are clothed with white scales. The *wings* are somewhat broad, measuring in a male 0.58 by 0.32 and the hind pair 0.50 by 0.34; they are scalloped on their hind edge with six rounded sinuses in each, those of the hind pair being more deep. They have a silky gloss and are grayish yellow or fawn colored, commonly freckled more or less with short transverse brown lines. The fore wings have the outer or costal edge straight with the ends gently curved, and the hind edge somewhat oblique and forming an obtusely rounded angle near the middle, the outer third of its length being straight or sometimes slightly concave. The costal margin is gray, tinged with green when alive, this color being much wider from the middle nearly to the tip, and much freckled with short transverse blackish lines. Forward of the middle a straight nut brown band crosses the wing obliquely, the outer end of which is faint and bent forward. Crossing the wing beyond its middle are two blackish lines, nearly parallel with the brown band and with each other, about four times their width apart, the hind one often a little bent outside of its middle, making the intervening space wider at this point, and then approaching the forward line and uniting with it on the costa. The space between these lines dark rusty yellow, appearing to the eye a broad dark colored band crossing the wing and continuous with a similar band on the hind wings. A cloud of sky blue scales bordering this band on the hind side of its inner end. A black spot on the inner angle, and a dark rusty yellow spot on the hind edge slightly inside of the tip. The hind wings have a broad rusty yellow band across their middle, continuous with that of the fore wings, but the blackish line on its anterior edge is faint or wholly disappears, whilst that on its hind edge is slightly thicker and more distinct than on the fore wings, and is bordered on its hind side by sky blue scales, which are more sparse toward the outer side of the wing, or wholly vanish. To these scales succeeds a second rusty yellow band, which becomes darker toward its hind edge. This band widens from its inner end to the middle, and from thence continues broad to its outer end; but frequently its outer half is faint, being tinged with lilac red, which color occupies the remaining portion of the wing, back of this band, except a large patch of rusty yellow on the hind edge at its outer end; and two or three lunules of rusty yellow surmount the notches which are next inside of this patch, the inner lunule being much more broad and conspicuous; and following it is a black lunule surmounting the inner notch of the series. The fringe is short and gray intermixed with scales of sky blue, with a brown line across its middle and another at its base. The underside is bright orange, the costal margin of the fore wings gray. Both pairs are crossed in the middle by a

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single very distinct nut brown line, which, upon the fore wings, is a little thicker and slightly flexuous and is bordered on its hind side with lilac gray, which color sometimes shows a faint slender brown line along its hind edge, parallel with the preceding one. Back of the line across their middle the hind wings and the inner part of the fore wings are lilac grayish with the hind border orange. The *legs* are rather short, the thighs varying in color from orange to pale violet yellowish; the shanks and feet are gray-green in the live insect, fading to gray in the dried specimens, freckled sparsely with black atoms, their exterior side being blackish. The hind shanks are longer and much thicker than the thighs, and have two pairs of long stout spurs. The feet are distinctly five-jointed, the joints cylindric and successively shorter and diminishing in thickness.

The colors and markings of some specimens vary from the description above given. The fore wings sometimes have all their surface back of the band darker, of a reddish lilac color, thus corresponding with the hind wings. In the female specimen before me the blackish lines crossing the wings are widened to double their thickness in the males and are of a paler or brown color with their edges indistinct. The female figured by Herrich Schœffer appears to have had the second line on the fore wings wholly effaced.

This is a rare insect and it is probably impossible for it to become so multiplied as to occasion any material injury. Should there be a few clusters of its larvæ upon the lilacs in a particular neighborhood, notwithstanding the manner in which they disguise themselves, some bird would discover their real character, and they thereupon would all be speedily found and destroyed. I placed a cluster of eggs which were beginning to hatch, in contact with a leaf of a lilac bush. The infant worms thereupon were watched day after day for about a week, when they all abruptly disappeared. Some bird had undoubtedly discovered and destroyed them. I regretted the loss but little, thinking that as some fifty worms in the flock of the previous summer had matured and buried themselves in my grounds, one or more broods from them would in all probability soon appear upon some of the lilac bushes in the yard. But I was disappointed. They nowhere showed themselves. The birds had probably learned the disguise which they assumed; this disguise thereupon ceased to be a safeguard, and the whole progeny from the previous year's flock of worms was destroyed it is most likely when but a few days old.

These facts indicate by what a very precarious tenure it is that this species holds itself in existence. Wherever a few families of its young show themselves, they are discovered by the birds and are immediately exterminated. Thus it seems to be only in a locality here and there, where the birds from not seeing any of these worms for some years, have forgotten the mask which they put on, that a flock of them is able to elude their inveterate foes and grow up to maturity. And thus a season will sometimes arrive when a vigilant collector

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will obtain a few specimens of this moth, and it will then vanish and he will meet with it no more.

JOHNSON'S PRIOCYCLA, *P. Johnsonaria*, new species.

It has been remarked above that the insect treated upon is the type of a distinct genus, of which genus it is the only member as yet known. Whilst I am engaged in preparing the foregoing account, there comes to me, through the open door of my study, attracted by the light of the lamp, a moth whose scalloped wings and other characters at once show it to be intimately related to the one under consideration, a second species pertaining to the same genus. It was upon the 28th of June that this specimen presented itself to me, the same date on which the moth of the preceding species began to come forth from the pupæ in my cages. Anxious to obtain other specimens of this variety, I, on several of the following evenings, went with a lighted lamp to different parts of the grounds around my residence, but without any success.

I dedicate this interesting discovery to the memory of the late Secretary of our State Agricultural Society, Hon. B. P. Johnson, whose efficient aid, rendered on numerous occasions, has much assisted me in these investigations of our noxious insects.

This species may be briefly defined as follows: Yellowish brown; fore wings with a subcentral black dot and crossed obliquely by two distant blackish lines; hind wings with a faint brown band and a blackish line; under side pale lemon yellow, posteriorly grayish brown, with numerous brown freckles and a blackish band and line crossing both wings. Width of the male 1.35.

The *head* is tarnished gray, and is flattened in front. The palpi are blackish along their under side; their third joint small, twice as long as thick, almost cylindric, slightly diminishing in thickness toward the tip, which is obtusely pointed. The antennæ are more than half the length of the body and pectinated in the male, the stalk being gray and its branches pale brown and identical in their details with those of the preceding species, the last ten or twelve joints being destitute of branches and merely toothed along their under side. The *thorax* is tarnished gray. The *abdomen* is yellowish brown, unicolor with the wings, with a row of dusky brown spots along each side. Beneath it is gray, freckled with pale brown spots and dots. Its tip is on a line with the inner angles of the hind wings. The *wings* are moderately broad, the fore pair measuring 0.63 by 0.32, and the hind pair 0.51 by 0.37. The fore wings have their costal edge straight, with but a slight short curve at each end; the hind edge oblique and convexly rounded, with the outer third of its length straight, this edge being slightly scalloped, with shallow sinuses and short broad lobes, which are rounded and not at all angular. They are of an umber brown color, the basal two-thirds of their length tinged with dull yellow; the costal margin dark grayish,

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freckled with black. Forward of the middle a very distinct blackish brown line extends obliquely across these wings, which is gently curved, and near its outer end is abruptly bent forward at a right angle, and is slightly thicker at this end. Beyond the middle is a similar line, parallel with the first, and near its outer end slightly waved and perceptibly thickened, this line separating the yellowish brown anterior from the darker brown posterior part of the wing. Between these two lines, outside of the center of the wing, is an oval transverse black dot, formed of elevated scales. A faint dusky streak extends from a little inside of this dot to the inner margin, nearly parallel with the bluish brown lines. Beyond the posterior line the dark ground color is freckled with a few black atoms. Half way between this line and the hind edge is a small blackish spot near the inner margin, and a blackish transverse streak toward the outer margin, the hind edge of which is darker and more distinctly defined. Back of this streak a coffee brown cloud, having a silky grayish reflection, occupies the tip of the wing. The hind wings have their hind edge strongly rounded, forming almost a half circle, and deeply scalloped, both the projecting lobes and the intervening incisions being rounded. Their ground color is the same with that of the fore wings, but their fore part is less tinged with yellowish, and is sprinkled with a few black atoms. Forward of their middle they are crossed by a straight faint dusky brown band, which is continuous with the dusky streak inside of the black dot of the fore wings. Parallel with this band and crossing the wings a little beyond their middle is a very distinct blackish brown line, nearly straight, and in line with the blackish spot near the inner angle of the fore wings, all the space back of this line being a shade darker and without spots or clouds. The fringe is short, toward the tips of the fore wings very short, and is concolor with the wings, on the under side showing a darker brown line at its base. On the under side both pairs of the wings are alike in their colors and marks, the basal part being dull pale lemon yellow, and the hind part darker, dull pale brown, the two colors separated by a slender gently waved blackish brown band which is placed slightly back of the middle, and is curved and parallel with the hind margin, and forward of this is a broader brown band with its edges indefinite, crossing the wings straight and oblique on the upper, curved on the lower pair, its outer end not attaining the costal edge, its inner end on the hind wings much narrowed, the subcentral black dot of the fore wings appearing as a short black streak upon the hind edge of this band, and a black crescent also on its hind edge in the middle of the hind wings. Both pairs are much freckled with brown and blackish dots and short transverse lines. The fore wings have their inner border broadly stained with brownish gray, and also show a blackish transverse cloud forward of their tips and a smaller one on their inner angles. The *legs* are gray with a tinge of tarnished yellow, and are freckled with numerous brown dots. The tips of the anterior shanks are black, and the hind shanks are a third longer and beyond their middle a third thicker than the thighs.

White Butterfly, *Pieris oleracea*, Harris. (Lepidoptera. Papilionidæ.)

Eating holes in the leaves of the cabbage, turnip and radish, a nearly cylindrical pale green worm having a darker streak along the middle of its back, and growing to over an inch in length, its pupa naked, angular, white or pale, suspended by a thread around its middle, under a board or similarly dry situation and producing a white unspotted butterfly about two inches wide.

One of the most interesting of our garden insects is the White Butterfly as it is currently named, which in July and August is daily

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seen flying about the garden. It pertains to a group which has been termed the *Brassicaceæ* or Cabbage Butterflies, from the fondness which those of their larvæ whose habits have been observed, nearly all manifest, for feeding upon the different plants which pertain to the genus *Brassica*, the cabbage, cauliflower, kale, and turnip, though they readily nourish themselves also upon any of the other species of the natural order *Cruciferæ*, the mustard, radish, horse-radish, nasturtion, water-cress, etc., to which order of plants most of the species appear to be confined. They are also termed the Garden-white Butterflies, from the places they frequent and their being so uniformly of a white color. This group is quite extensive, the species being distributed over most parts of the world. They are especially numerous in the tropical countries of the eastern hemisphere, whilst here upon the American continent their numbers are very few. This White Butterfly is our only native species in the central and northern sections of New York, its geographical range being known to extend west to Lake Superior and north to Labrador and the sixty-fifth degree of latitude. Originally subsisting upon some one or more of our wild plants of the order *Cruciferæ*, it has now become accustomed to lay under contribution for its support our cultivated plants of this order, particularly the cabbage and the turnip; and these plants being grown so extensively in all our gardens furnish it an abundant supply of nourishment, whereby its numbers are now greatly increased. I think I am safe in saying that within the sphere of my own observation these butterflies of late years are ten fold more numerous than they were forty years ago. Complaints of their injuries are getting to be frequent, and they are threatening to become a formidable evil.

The White Butterfly comes out of the pupa shell in which it reposes through the winter, and begins to be seen along road sides and in the meadows on the first coming on of warm weather. Pupæ which I had kept in a stove warmed room through the winter, gave out the butterflies on the twenty-seventh day of April, and it is only ten or twelve days later than this that they come out when they are in the outdoor atmosphere. Several years I have noted them as being first seen on the eighth and other years on the ninth day of May. One year only have I seen them abroad earlier than this, on the sixth day of the month. It is along road sides and in the meadows that they mostly occur at the commencement of the season.

The sexes pair and the female commences laying her eggs immediately on issuing from the pupa state. At this early period in the season there are no garden plants sufficiently grown for it to resort

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to them; and it being a native insect of our country we know its natural food must be some one or more of our indigenous plants, on which it wholly subsisted before the cabbage and our other cultivated vegetables were introduced upon this continent. I find it is nourished upon the water-cress or yellow rocket, the *Barbarea vulgaris*, much more extensively than upon any other plant, wild or cultivated. Our botanists have usually regarded this as a native plant of this country; but as it is also a European plant some have supposed it was probably originally introduced here from abroad. It occurs in such abundance in our moist lowland meadows and also in dry gravelly upland soils that it has every appearance of being a native plant. And this insect feeding upon it in such numbers as it does, is a further indication that it is an indigenous plant. It, more than any other member of the vegetable kingdom, appears to be the natural food-plant of this butterfly.

This plant starts into growth so early in the spring that its radical leaves become sufficiently expanded to meet the wants of this butterfly when it first makes its appearance. And it is principally upon this plant that the first generation of each year is reared. It, however, is no doubt able to sustain itself upon several other wild plants of the order Crucîferæ. And later in the season, when the cabbages, turnips and radishes in our gardens are sufficiently grown to be adapted to its wants, it begins to bestow its eggs upon them. It sometimes invades the cabbage when the plants are only six or eight inches high with but five or six leaves put forth upon them.

When engaged in depositing its eggs it flies very slowly just above the tops of the plants, alighting upon a leaf here and there; and so intent is it upon the work in which it is engaged that it will sometimes come quite near a person, without manifesting any fear, or quickening its flight to move away.

Alighting, it stands upon the edge of the leaf, and bending its body downward it touches the tip to the under surface of the leaf, planting an egg thereon, placing it from an eighth to a quarter of an inch inward from the edge of the leaf. From one to three eggs, placed slightly apart from each other, are thus glued to the underside of the leaf, when it again takes wing and searches out another leaf such as it desires.

The eggs are nearly one-twentieth of an inch in length and twice as long as thick. They are shaped like a sugar-loaf, being cylindrical, with the base cut off transversely and the opposite end gradually tapered to about a third of the thickness and then abruptly and

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bluntly rounded. They are beautifully sculptured, being ribbed lengthwise and closely and very minutely striated transversely. The number of the ribs or elevated ridges is fifteen. The eggs are of a very pale greenish white color and the ribs clearer whi.e. They are slightly glued to the underside of the leaf by a gummy substance which is soluble in water, whereby they would probably be washed off the leaf by the rains, were they not placed on the underside where the wet will not reach them.

The eggs which are laid in May hatch in about ten days, and later in the season, when the weather becomes warmer, they probably hatch in a shorter time. Some authors state that the worms of this genus, in hatching, burst open the egg shell. This is not so, at least of this species. The worm begins to feed when it is inside of the shell. When it first wakens to life it commences opening and closing its jaws. These, being in contact with the inner surface of the shell, scratch upon and erode it, its ribbed uneven surface aiding to expedite this operation. At length a small opening is hereby made in the shell. The edges of this opening are then eaten away, more and more, until a hole is made, sufficiently large for the worm to crawl out. And after making its exit, the worm continues to nibble at this opening, until it has eaten the whole of the shell.

When it first issues from the shell it is a minute cylindrical worm of a glossy, watery-white color, thinly clothed with fine shortish hairs. It clings to the leaf with the thick fleshy legs at the hind part of its body, throwing its head suddenly and spitefully from side to side when anything molests it. The first worms coming out as they do in May, are liable to encounter some frosty nights and cold chilly days, during which they remain clinging to the leaf, torpid and motionless, awaiting the return of a more genial atmosphere to warm them again into activity.

The infant worm, having consumed the egg-shell, begins to feed upon the green leaf, and immediately thereupon its body begins to acquire a green color. It eats small round holes through the leaf when it is young, larger and less regular ones as it advances in size and approaches maturity. It feeds mostly by night and remains at rest during the day, frequently standing in the groove made by the mid-vein on the upper side of the cabbage and turnip leaves, with its head downward, toward the base of the leaf. But if there is a fold in the margin or any other covert where it will be more hid from view, it conceals itself therein. It resorts to the same place upon the leaf day after day, spinning and fastening to the surface an exceedingly fine

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web of silken threads to give it a more secure foothold. It moves about but little, crawling very slowly, with its mouth to the surface on which it is crawling, placing there a silken thread to aid it in clinging. It seldom quits the leaf on which it is placed, if this is of sufficient size to fully feed it.

This worm grows to nearly or quite an inch and quarter in length and 0.15 in thickness. It is slightly thickest in its middle and more tapered toward its hind than its fore end. It is divided by transverse constrictions into thirteen segments including the head, the two last segments being less distinctly separated. It is of a pale green color, similar to that of the leaves of the cabbage and swedish turnip, and along the middle of the back is a darker line. The whole upper part of the body above the breathing pores is dusted over with minute black atoms, the coarser ones of which are arranged in transverse rows, and the surface is clothed with numerous fine, short white hairs. Its head is of a flattened globular form, of the same width as the neck and is held vertically. It is of the same pale green color as the body, with little, if any, glossiness, and is thinly covered with fine white hairs. Low down on each side is a row of four black dots, and the six or seven minute teeth with which each of the jaws are furnished, are also black.

When it has done feeding it remains at rest upon the leaf about twenty-four hours. It then crawls away from the plant and wanders about until it finds a suitable situation in which to repose during its pupa state, the underside of fence-rails, of stones in a wall, of limbs of trees, or some similar spot where it will be dry and sheltered from the rain. They appear to be particularly careful to place themselves where no wet will reach them. Thus I have once met with a number that on leaving the garden had crawled under the portico of the contiguous dwelling, and had there placed themselves along the lower edges of the clapboards to remain through the winter where persons were passing quite close to them every hour of the day.

The very curious operations of these cabbage butterflies in passing from the larva to the pupa state, the spining of a loop or girdle of silk threads around their bodies to hold them in a particular position, and the drawing of their bodies out from the old skin in such an artistic manner as to have the girt remain around them, were long ago stated so accurately by the philosopher Reaumur, that I am able to add but little to the account he has given. Observers will frequetly be disappointed of the opportunities they expect for examining these phenomena, as they take place more frequently by night than by day.

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Having found such a situation as it requires the larva determines in what position it will place itself to remain during its pupa state, for there is much diversity in our white butterfly in this respect, it being sometimes suspended upon the underside of a horizontal or an inclined surface, and at other times against the side of a vertical surface; and it is held in a variety of positions, horizontal, oblique, or almost perpendicularly upward or downward, usually with its back but sometimes with its right or its left side downward.

Having selected the spot it will occupy and the position in which it will suspend itself, it requires a loop to be made around its body to hold it in this position. To give its feet the secure foothold they will require while this loop is constructing it first spreads a slight carpeting of silk threads upon the surface on which it is to stand, forming also at its lower end a thick mass or little hillock of these threads. It then fastens the hooks of its hind feet securely into this mass of threads, and clinging to the carpeted surface with its middle legs, its body is so very soft and flexible that it is able to bend and turn its head backward touching either side or the top of the back at a point one-third of the distance from the hind to the fore end. And with its head thus turned backward it fastens to the surface at one side of its body a thread of silk which it spins from its mouth. It then carries its head up over its back and down upon the opposite side of the body, where the mouth fastens the other end of the thread, thus forming a loop around its body holding it to the surface on which it is standing. This single thread, however, is exceeding fine and possessed of but little strength. The worm therefore carries its mouth back again by the same route, to the opposite side, thus spinning a second thread, with its end fastened at the same point where the first one was commenced. And it thus continues to move its mouth from one side to the other, until it has formed a skein of threads of sufficient size and strength to securely sustain the weight of its body. Reaumur states the number of threads in the loop to be about fifty. But in our American species there is no uniformity in this loop, it being in some instances not a fourth the size that it is in others. If the larva gains some secluded corner where it will experience no molestation, it does not trouble itself to spin but a few threads to form this loop.

The most laborious part of this work, and that which occupies the principal part of the time that this loop is being constructed, is the fastening of the ends of the threads to the surface on each side of the worm. As the tension upon the threads is almost directly upward

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it has a strong tendency to tear them from their attachment, and the worm shows particular care in fastening the ends securely, applying its mouth to the surface at numerous points to glue the thread thereto, whereby a dense web comes to be formed upon the surface around each end of the loop. The worm, moreover, moves its body from side to side with each thread that is spun. When a thread is about being fastened upon the right side, to give the mouth the requisite room for attaching it to the surface, the body is crowded to the left, as far as the threads already spun will admit, thus putting these threads on the stretch, whereby the worm will ascertain if it is fastening them sufficiently secure.

Having completed its skein of threads the larva straightens itself, and it is then noticed that about two-thirds of its length is forward of the skein. It now becomes quiet and motionless, but its body gradually contracts in length, whereby at the end of an hour or two its anterior part is found to be but half as long as it previouly was, the skein now girting it around its middle. It has also undergone a sensible change in its form, that portion which is forward of the girt being thicker and cylindrical whilst that which is back of it is gently tapered.

The larva remains in this position, with its hind feet fastened into the little hillock of silk threads at the end of its body and the loop around its middle, from twenty to thirty hours. Then, with some writhings and contortions a cleft is opened in the skin on the upper side of its neck, which crack soon extends along the middle of the head and the fore part of the back, forming an orifice of sufficient size to allow the body to pass out through it, and when the head is also disengaged it rests upon the old skin of the larva. The pupa now by contracting and elongating itself rapidly crowds the skin backward crumpling it together underneath its body, until only the conical hind part remains upon the pupa. Being securely held by the loop of silk which is now around it, the pupa readily withdraws the tapering hind end of its body from the remainder of the larva skin, and the tip of its body being furnished underside with a number of minute hooks, it pushes these backward beyond the shriveled remains of the larva skin, and fastens them into the little wad of silk threads to which the larva skin is also attached by the minute hooks of the hind feet. This larva skin being now a crumpled mass of membrane and hairs, discommodes the pupa by being crowded as it is under and around the hind end of its body. In order to remove it therefore, the end of its body being bent into a curve at this time

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and fastened at its tip, it moves this part of its body around and around, in a rotary manner as it were, thus crowding against the pellet of old skin, dislodging it from its former place, and gradually breaking it off from its connection with the little bundle of silk threads. It continues this motion some little space of time to accomplish this purpose, over a half minute I should judge it to have been, in the instance which I witnessed. At length the crumpled mass, having become rolled into a little wad no larger than a kernel of allspice, becomes entirely detached and falls to the ground.

As yet the pupa retains the shape of the larva, being thickest anteriorly and gradually tapered to the tip, without any angular projections upon the back, only the horn at the anterior end and the wing sheaths having their pupa development. But the protuberance upon the back of the thorax case soon begins to appear, and shortly after this a slight angular projection becomes perceptible upon each side of the middle of the back. These gradually become more prominent, and in a short time the whole surface becomes molded into its normal pupa form.

The chrysalis or pupa of this as of many other butterflies has such a singular form that persons not versed in entomological science will deem its back to be its under side. It is what is technically termed a naked, suspended, angular pupa; that is, it is not inclosed in a cocoon or other covering; it hangs suspended in a loop, and its surface presents angular processes and projecting points. Along its under side it is smooth and nearly straight from end to end, but its back is much bulged and uneven, with angular ridges and projections. It is of a white or yellowish white color, frequently with stains of brown on some parts of the surface, and with numerous black dots of different sizes, the most of which are placed symmetrically.

The PUPA is about 0.70 long, 0.15 wide and 0.24 high. It is divided into twelve segments, the sutures between most of them being quite conspicuous. The first segment or head case is prolonged forward into a prominent conical point which is curved gently upward and is bluntly rounded at its tip. Near its base on the upper side are two small projecting points which are usually black. From each of these an elevated line extends obliquely backward and inward to the anterior end of a prominent keel-like ridge along the middle of the occiput which is the anterior end of the prominent dorsal ridge, and is of a black color. The second segment or thorax case is elevated in the middle of the back into a very prominent stongly compressed nose-like ridge, which is rounded at the summit and descends backward in a straight or nearly straight line, a slight notch usually occuring toward its end, made by the suture between this and the third segment. The third segment is short, the ridge upon its middle is black, and it frequently shows four dots in a transverse row on its anterior part, the outer dots being longer. The fourth segment is equally or more short than

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its predecessor and is recognized by some slight transverse lines or wrinkles upon its surface and by the loop of silk which passes across its middle. It frequently has six or eight black dots placed symmetrically and in positions similar to those upon the following segments. The fifth or first abdominal segment has a slight elevated line upon its middle which in some instances wholly disappears. Upon each side of the back this segment is elevated into a prominent ridge, beginning upon the anterior margin and gradually ascending to the hind margin, with a broad shallow notch in its middle and frequently a brown spot upon its anterior ends. The sixth segment upon each side continues the elevated ridge of the preceding segment, at its anterior corners jutting abruptly upward and forming a prominent angular point, which inclines outward, overhanging and protecting the wing sheaths, the inner edges of which overlie the base of these ridges on their outer sides. The angular apex of each ridge is frequently stained with brown or black. From this point the ridge descends backward in a straight line, ending at the hind edge of the following segment, and a raised line is continued from thence along each side of the back to the tip. Along its middle the sixth segment has a slighly raised line, which on the following segments becomes more elevated, forming an acute angular line along the middle of the back, and on the last segment dividing into two straight diverging forks which extend to the tip, their ends there uniting with the ends of the lateral dorsal lines. On the back of these segments are usually twelve black dots, placed symmetrically, one on each side of the center of each segment; two others further out and back, one before the other; a fourth one still farther out and upon a transverse line with the first; a fifth obliquely forward and outward from the last, and the sixth one larger than the others, on the anterior corner of each segment. On the under side these segments frequently show a row of small blackish spots along the middle, the spots being often faint and more or less obliterated, and on each side three longitudinal rows of black dots, the second row being formed of a large and a small dot upon each segment. The veins of the wing sheaths are also finely dotted, with a series of larger dots alternating with the tips of the veins.

The pupa remains quiet and motionless, with the tip of its body fastened in the little mass of silken threads and the loop passing around it and holding it suspended in a horizontal or oblique position, for a period of eight to twelve days in summer, and seven months in the winter, it entering this state the beginning of October and continuing in it till the following May. The ridge along the forepart of the back of the pupa then cracks apart and the inclosed butterfly withdraws itself from its pupa case, and stands beside it for a few hours for the several parts of its body to dry and acquire their requisite solidity and strength, when it flies away in search of its mate. Thus, while the winter brood is over half a year in completing its transformations, the summer broods reach maturity in from four to six weeks, the period appearing to vary as the weather is more or less warm and dry.

The BUTTERFLY varies from 0.60 to 0.70 in length and from 1.80 to 2.15 in width across its spread wings. Its body is black and clothed with hairs or in some places with scales. The *head* is thickly covered with shortish hairs, which are black and

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white above, white on the underside, and on the face white with two vertical rows of black. Palpi straight and held projecting obliquely forward and upward, covered with white scales, the last joint black with its sides white. Eyes in the live insect greenish white with rows of movable blackish dots, the central one being coal black; in preserved specimens brown or brownish gray. Spiral trunk equaling the antennæ in length. Antennæ black above, white beneath, and alternated with these colors along the sides, the knobs at their ends compressed and widening outward, with the tips bluntly rounded and pale tawny yellowish. The *thorax* is black and clothed with soft hairs of a leaden white color. Breast covered with white hairs. The *abdomen* is black on the back, at base with hairs similar to the thorax. On the sides and beneath covered with appressed white scales. The *legs* are pale brown, the thighs black, more or less covered with white scales and on the underside with white hairs. The *wings* are milk white above and beneath, and without spots. They are dusted with black scales at their base, sometimes very slightly or not at all on the hind pair, but commonly more broadly, these scales extending along the outer margin frequently nearly a third of its length and in rare instances the entire length. The tips sometimes show similar black scales along the veins. On the under side the hind wings always have a stain of ochre yellow at the base of their outer margin. The fringes are short and white.

The under side of the hind wings are subject to some variations in color which it is important to notice. Instead of being white they are of a pale sulphur or cream color, the tips of the fore wings also participating in this hue. Boisduval regarded these as a distinct species, which he named *Pieris cruciferarum*, a name indicating them to be connected with the cruciferous family of plants. Another variety has the veins here broadly marked with dusky or blackish. It was from specimens with the wings thus striped that Dr. Harris drew up his description of the species. Still other specimens occur with the under side of these wings pale yellow, as in *cruciferarum*, and with the veins dusky as in the preceding variety; and these have been treated as a distinct species by Mr. Kirby, under the name *Pontia casta*, the chaste or unspotted Pontia. These varieties occur associated together, and that they are mere varieties and not distinct species I am assured, from having met with them paired with each other.

Dr. Harris, in Agassis' Lake Superior, says: "Specimens of the females have been seen, though rarely, with one or two dusky spots on the upper side of the fore wings." I have never met with a specimen showing these spots, and from the indefinite manner in which Dr. H. speaks it is evident he was unacquainted with examples of this kind. Specimens have been presented for my inspection as being this variety, having a faint dusky spot slightly beyond the center of the fore wings and a similar duskiness on their tips, and also a dusky spot on the margin of the hind wings. I have recently obtained

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specimens marked identically in this manner, and others having a second spot on the fore wings, more faint and small, placed inside of the sub-central one, which I know to be males and females of *P. Rapæ*. And we should expect hybrids of this species and *oleracea* would be marked in this faint manner. But it will be truly remarkable if genuine specimens of *oleracea* vary to present faint spots placed as they are either in *Rapæ* or *Protodice*.

This is currently termed the White Butterfly, which name distinguishes it with sufficient clearness from all the other butterflies of the region in which it abounds. It was first scientifically named and described by Dr. Harris, in the New England Farmer, 1829, vol. 7, p. 402, *Pontia oleracea* or the pot-herb Pontia being the designation he bestowed upon it; and under this name he noticed it more or less fully in his subsequent publications; his discourse before the Mass. Horticult. Soc., 1832, p. 7; his report to the Legislature on the Insects of Mass. injurious to vegetation, 1841, p. 213; his paper on Lepidoptera, in Agassis Lake Superior, 1850, p. 386, where a figure of it is also given; his Treatise on the Insects of New England, 1852, p. 233, and Flint's edition of this treatise, 1862, p. 269. Boisduval inserts it under the name *Pieris oleracea*, in his Species General des Lepidopteres, 1836, vol. 1, p. 518, and on the next page describes *Pieris cruciferarum* as a distinct species, as we have noticed above. Mr. Kirby in his Fauna of North America, published 1837, p. 288, alludes to *Pontia oleracea* by name in connection with his supposed species *Pontia casta*.

It will be noticed that these authors disagree as to the generic name of this butterfly. Whilst Dr. Harris and Mr. Kirby term it a *Pontia* Boisduval calls it a *Pieris*. The question thus arises, which of these names are we to adopt as being the correct name for our insect? This is a difficult point to determine, as will appear from a brief notice of the manner in which these names were introduced into the science and the posture in which this subject stands.

These white butterflies pertain to a section of the old genus *Papilio*, which Linnæus fancifully designated *Danai Candidi* or the White Greeks. The Bavarian naturalist, Schrank, in the second volume of his Fauna, which was published in 1802, elevated this section to the rank of a distinct genus, to which he gave the name *Pieris*. Fabricius, at his death, left a manuscript revision of the order Lepidoptera, which it is to be regretted has never been published. A short abstract of the genera proposed in this manuscript was given by Illiger, in his Entomological Magazine, in the year 1807, the *Danai Candidi*

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of Linnæus being divided into two genera, namely, *Pontia* containing the white and *Colias* the yellow butterflies. Naturalists have since been greatly at variance as to whether *Pieris* or *Pontia* should be the name of the genus containing these white butterflies; and since they have more recently come to be further divided into smaller genera, the utmost confusion has arisen, as to the groups to which these names have been applied. Thus Stephens, Curtis and other British authors have given the name *Pieris* to what are termed the black-veined whites and *Pontia* to the garden whites. Boisduval, following French precedents, unites these and other genera of the British writers into an extensive genus containing 170 species bearing the name *Pieris*, whilst some half dozen species from countries bordering upon the Indian Ocean constitute his genus *Pontia*. Ochsenheimer, a leading German authority, includes these garden whites in quite an extensive genus to which he gives the name *Pontia*, thus differing diametrically from the French authors in the insects to which this name is to be applied. We thus have in this as in a number of other instances, some even of the most common and best known insects, presented to us under two or three different generic names, by our best authorities in the British, the French and the German schools. Under such embarrassing circumstances how are we to determine which name should be employed? In many of these cases our rules for regulating these names are not so fully agreed upon and established as to make our way clear. Upon one point, however, there is a general concurrence, to wit, that the name which is first proposed and published for a species or genus must be adopted, and all names which are subsequently given to the same species or genus must be rejected as spurious and mere synonyms. This rule is our only release from the embarrassment of the present case. The name *Pieris* having been proposed anterior to that of *Pontia*, it is entitled to be retained. Originally both the white and yellow butterflies were included under this name. But entomologists have all concurred in giving the name *Colias* to the latter, as proposed by Fabricius. The white butterflies, moreover, were the typical species of the original group. Thus the name *Pieris* rightfully belongs to them. And it would obviously be unfair to Schrank to supersede the name he presented, by one which was subsequently proposed. We thus find the name *Pieris* presenting stronger claims for being retained than the name *Pontia*. And authors are now coming to concur pretty generally in adopting this name.

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Cabbage Worm, or Turnip Butterfly, *Pieris Rapæ*, Linn. (Lepidoptera. Papilionidæ.)

Eating the leaves of the cabbage and turnip, and often gnawing into the compact heads of the former; a cylindrical green worm with a pale yellow line along the middle of its back and a row of yellow dots along each side, growing to over an inch in length; its pupa, naked, angular, gray, freckled with black dots, held in a loop on the under side of rails, boards, etc., and producing a white butterfly about two inches wide, its wings with black spots.

Since the preceding account of our native white butterfly, *Pieris oleracea*, was written, a closely similar but much more destructive cabbage butterfly has invaded our State, and has suddenly become so excessively multiplied and numerous, that it is no exaggeration to say it is now threatening to annihilate the cabbage crop. A new insect enemy of such importance has, of course, received my particular attention, and the present volume of Transactions having been delayed in its issue, I am enabled herewith to present, from the observations I have made, a history of this insect and its transformations, which will be found more full and exact than any account which has before appeared, correcting some errors of previous observers, and containing several new and interesting facts in the habits and economy of this important accession to the insect fauna of our country.

During the fore part of the year 1870, our white butterfly made its appearance in the usual manner. One or more of them might be seen almost every day flying about our gardens and yards. On the second day of August four white butterflies were hovering about and alighting around me in my garden, when one of them was noticed with much surprise as having a round black spot near the middle of its fore wings. Conjecturing it to be the spotted variety of our white butterfly, and anxious to secure the specimen, I hastened to obtain a net for its capture; but on being approached, to my great regret it flew wildly away. Next day, however, two similar specimens were noticed and captured, and on examination were discovered to be the European *Pieris Rapæ*. And on the following days these spotted butterflies occurred more and more common, whilst our white butterfly immediately vanished, not one of them being seen either in the gardens or the meadows. And this foreigner became more and more abundant till the close of the season, doing immense injury to the cabbage crop in all our gardens, greatly surpassing every other insect depredator upon this vegetable which we have previously known in our country. Around the city of New York and in New Jersey it began to attract public notice about the middle of July

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two or three weeks earlier than its appearance through the eastern and northern sections of the State.

This insect is a native of the eastern continent, and from time immemorial has been well known in all the countries of Europe, as being in its larva state a cabbage worm of all others the most obnoxious, it is so prone to attack the inner leaves of this vegetable, eating its way into the heads and secreting itself therein. Duponchel informs us that in consequence of this habit of penetrating into the interior of the plants on which it feeds, it in France is named the *Ver du cœur, i. e.* the Heart-worm. The butterflies are very common everywhere, in the gardens and meadows, beginning to appear the last days of April and continuing till the end of the season.

It was brought to this country in some vessel which discharged its cargo at Quebec. Mr. Riley, in his second report on the Noxious Insects of Missouri, p. 108, suggests it was probably introduced into this country in its egg state, upon a batch of refuse cabbage leaves which were thrown from some vessel, where, after hatching, the young larva managed to find suitable food close by. But the insect does not remain in its egg state the length of time required for such a voyage. The eggs, however, hatching on shipboard, the worms from them would readily sustain themselves on the leaves, and on reaching port where fresh vegetables could be obtained, the few wilted and decaying cabbages remaining would be thrown away, with some of these worms lurking among their leaves, whereby their race was probably started upon our continent.

It was in the year 1859 that this butterfly was first taken in Quebec, and Mr. J. G. Bowles, in a paper in the Canadian Naturalist for August, 1864, estimates that it had not then extended more than forty miles from Quebec in different directions. In 1866 it was captured in the northern parts of Vermont and New Hampshire, and in 1868 they had reached Lake Winnepesaugee, in the center of the latter State. Last year they were reported as having been taken at Bangor and other places in Maine, and also in New Jersey. The present year (1870), probably favored by the protracted drouth, they have suddenly overspread a large portion of the middle and western States, and have everywhere become so multiplied as to nearly ruin the cabbage crop in most of the gardens.

The eggs are placed indifferently anywhere upon the under side of the leaves, and somtimes one may be seen on the leaf stalk, on the edge of the leaf, or on its upper surface. They are but slightly attached to the leaf, separating therefrom if gently pressed against.

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They are so very small that the eye does not notice them unless the attention is turned toward them. They are then readily perceived, being much paler than the leaf of the cabbage or the Swedish turnip. To the eye they appear like little pale yellow grains projecting out from the surface of the leaf, more high than thick. A seed of Timothy grass laid upon the leaf beside one of these eggs is found to be three or four times larger than the egg. They are white when newly laid and acquire a yellow tinge afterward.

When examined with a magnifying glass, they are found to be cylindrical and shaped like a sugar loaf, with the end which is glued to the leaf cut squarely off and the opposite end tapered to a point with a small portion of the apex cut squarly off. Their surface is glossy and beautifully sculptured, being fluted or ribbed lengthwise, with intervening grooves, and transversely it is closely and evenly striated with exceedingly fine impressed lines. One of these eggs, of which I carefully count the number of the ribs, has twelve only. The length is 0.045, and it is about four times as long as thick.

The eggs hatch in about a week after they are laid, the inclosed worm eating an opening through the shell of sufficient size to enable it to crawl out therefrom. The evacuated egg shell is whitish and translucent, the elevated ribs appearing as slender opaque white lines. A worm which I watched as it came out of the shell measured 0.065 in length. It was glossy and pale, tinged slightly with yellowish. Its body was slightly tapered from before backward, its sutures marked by transverse constricted lines, the intervening segments being roundly elevated. The head was a little thicker than the body and clothed with fine black hairs, the body having finer whitish hairs.

The first act of the worm is to eat the shell of the egg from which it has been hatched. It first gnaws an opening on one side from the top nearly to the base, and then very slowly nibbles the sides of this opening, and the base of the shell, until it is so cleanly consumed that no indications of the spot where it was placed remain. In the instance observed, the worm was occupied five hours in eating its shell. When this is accomplished it remains at rest for a few hours.

Its second act is to weave a mat or carpet to give it a more secure foothold upon the leaf. Applying its mouth to the surface of the leaf and moving it from side to side, it spins therefrom a thread of silk of most extreme fineness, which it fastens to the surface, crossing it in every direction, until it forms a thin film, which to the eye appears like a small glossy spot, very visible in a particular reflection

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of the light, looking as though the leaf had there been lightly touched with varnish. If nothing occurs to drive it therefrom, this spot becomes its residence for a few days. And wherever it takes up its abode subsequently, it constructs a similar mat, into the threads of which it can catch the minute hooks of its feet, to render its standing more secure than it is upon the naked surface of the leaves.

It next begins to feed upon the leaf, some six or twelve hours after it has finished eating the egg shell. At some point slightly outside of the edge of the mat on which it is standing, it eats a round hole, the size of a small pin head, into which it gradually sinks its head, deeper and deeper, until it passes through the parenchyma of the leaf to the skin of its upper surface. As yet it is so small that the eye only perceives it to be a minute cylindrical pale yellow worm, usually lying straight and motionless on the leaf. But as it feeds on the green pulp of the leaf, its body acquires a green color and slowly increases in size, growing about one-thirtieth of an inch in length daily.

Foreign authors state that in getting its growth this cabbage worm molts or casts its skin "several times." I can say with perfect confidence, it is only three times that it molts. When it first comes from the shell it is extremely soft and its skin admits of much distention before it constricts the worm to such a degree that it requires to throw it off. It is not till it has grown to double its first size and is 0.12 to 0.15 long that it casts off its skin the first time. It then feeds and grows till it has again doubled its size and is 0.25 to 0.30 long, when it molts a second time. It again doubles its size and becomes about 0.50 long, when it makes its third molt; and the skin which it then acquires it retains till it reaches maturity, throwing it off only when changing into its pupa form. This is the uniform course of these worms, as I have observed in a number of instances. The only aberrations I have noticed in these moltings are, that one of them is sometimes deferred till the worm is much larger; yet this does not appear to affect the other moltings of the same worm, for these occur as usual. Thus, in one instance the second molting did not take place until the worm was 0.38 long; yet the third occurred when it was 0.53. In another instance the second molting took place when the worm was 0.30 long, yet the third was deferred until it was 0.64.

When the worm is about to change its skin it ceases to feed and crawls to a part of the leaf where it will not be liable to be disturbed, commonly placing itself on the upper side of the leaf, frequently in a

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groove formed by one of the larger veins, but quite often on the even surface of the leaf. Having selected the spot it will occupy, it spins and weaves a carpet of threads on which to stand securely, it being of the utmost importance to have its hind feet firmly fastened. It stations itself on this carpet, standing with its head downward toward the base of the leaf. It remains in this position twelve or sometimes twenty-four hours, awaiting its change, sometimes bending its body slightly for a short time and then straightening itself again, raising its head for a moment and then lowering it, or giving a sudden shrug or jerk of its body, especially if anything intrudes upon it.

The worm at this time presents some alterations in its form and appearance. The most conspicuous of these changes is in the neck or second segment, which is stretched out to double its ordinary length, its anterior part being smooth and shining and strongly narrowing to the base of the head. This smooth glossiness of the neck is a character by which we always know when one of these worms is about to molt. On each side of the neck are six small black dots, four of them placed in a curved row which extends obliquely downward and forward, and the other two are back of these. The head is translucent and colorless, with a green cloudiness at its base. On the throat is a smooth protuberance as long as wide, its end rounded and feebly translucent.

After standing nearly motionless for several hours some slight distortions and writhings of the worm begin to be perceptible. The fore part of the body at times becomes distended and cylindrical and the hind part is less thick and tapering; anon the fore part becomes shrunken and the middle is distended; these phenomena being evidently produced by the movements of the worm pent up within the skin, contracting and elongating itself, and pressing now against one part and then against another. At length, as if it had become impatient with this long dalliance and delay, a more vigorous and determined pressure upon the anterior end is evident; slight tremors and twitchings of the fibers upon the top and side of the neck are seen, and soon the skin all around the suture at the base of the head parts asunder, the head is pushed forward and with a gentle wriggling the large new head is crowded out from the open end of the skin, with the old head, which is now an empty shell, adhering to and covering its mouth like a muzzle. And continuing to wriggle and squirm and elongate itself, the three first rings and their feet are slipped out from the old skin, which is crowded back, constricting the remainder of the body, the liberated anterior portion being bulged

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out broader than the confined part, and very soft and bright green. The hooks of the hind feet being securely fastened in the threads of the carpet on which the worm stands, it now with its liberated anterior feet draws itself slowly and gently forward, with some slight writhings, thus freeing more of the body from the old skin. And now at the tip of the body a portion of the skin is seen to be evacuated, the end of the body being slipped forward out of it, and only the gray membrane remains there. This membrane is so thin and soft that it sinks down flat upon the leaf, as the end of the body is drawn out of it farther and farther by the worm continuing to crawl forward. In two minutes from the time the skin is first rent open around the neck, the body becomes wholly released from it. The skull of the old head, however, still remains upon the mouth of the worm, clinging thereto with much tenacity. To loosen and detach it the worm repeatedly rubs and presses it against an elevated vein of the leaf or any other projection it finds, persevering in its efforts until it at length succeeds, two minutes more being usually spent in releasing the mouth from this encumbrance.

It then rests, standing on the leaf with the skull of the old head in front of it, and the cast skin behind it. The latter is about half the length of its body, and is a flattened gray film, notched at its hind end, rounded in front and turned upward along each side. The worm remains at rest commonly about an hour. It then steps forward to the old skull and crowding against it with its head rolls it off from the leaf. It next turns around and walking back to the cast skin commences eating it, wholly consuming it in about five minutes. After this it again rests an hour or more. It then wanders away and goes to feeding on the leaves.

These cabbage worms have a different aspect when they are approaching maturity from that which they present during the earlier stages of their life. When young their skin is glossy and shining, and they are then more slender and their form cylindrical. This glossiness entirely disappears later in life, and the surface has a peculiar, somewhat velvety appearance, and the body becomes relatively thicker, with a more robust look, and perceptibly tapers from the middle toward each end.

When fully matured, these worms are quite uniformly an inch and one-tenth in length; but specimens one-tenth of an inch longer are sometimes met with. They are usually one-tenth of an inch shorter, or more, when they are at rest than when crawling.

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Their color is pale grass green, varying in the depth of its shade in different specimens, but always darker green than the pale leaves of the cabbage and turnip. They are commonly, but not always paler beneath. And they are particularly distinguished by a pale yellow line on the back, and a row of small yellow spots along each side.

When examined with a magnifying glass, the surface of these worms is found to be everywhere bearded with fine short whitish hairs, those upon the back shorter, and in the young worms black and interspersed with small stiff bristles. These hairs arise from numerous minute black elevated points, with which the surface is everywhere studded, the larger points being arranged in transverse rows, a row upon each of the elevated ridges into which the segments are divided by impressed, slender, transverse lines. In addition to these black points, a few pale dots or minute warts are more or less perceptible, one appearing on each side of the middle of the back, on the second elevated ridge of each segment, another lower down on each side, upon the fifth ridge, and some others below these. But on each of the three first rings these pale dots are arranged in a single transverse row, on the first elevated ridge, three dots on each side, placed equidistant from each other. Along the middle of the back is a pale yellow line, which is sometimes very faint, or visible only on the anterior rings. Low down on each side is a row of dots of a brighter yellow color than the line on the back, one on each segment, placed a little back of the breathing pore, and usually more or less united with the yellow ring around the breathing pore. The breathing pores are small, broad oval, dull white, inclosed in a black ring, which is bordered with yellow, this border being more broad on the fore side and sometimes wanting on the hind side. The head is spheroidal, and as broad as the neck, green and clothed with hairs. The legs and prolegs have the same green color as the body.

The most curious feat performed by this insect is the fabricating of a little girt or loop in such a manner that it will be around the body of the pupa to hold it suspended in an inclined or horizontal position. It devolves upon the larva to make this girt and place it around its own body in such a manner that when its skin is thrown off to enable the pupa to appear, the girt will not be displaced but will encircle the pupa in the required manner, as the latter is destitute of any mouth, feet or other members to enable it to make this girt or to adjust it in the proper position around its body. The process to be gone through with is quite similar to that of suspending the arm in a sling fastened around the neck and then drawing the coat sleeve from off the arm without drawing the sling off with it.

When the worm has become full fed it remains at rest some twenty-four hours. It then wanders about until it finds a suitable place in which to repose during its pupa state, the under side of a rail, a board lying partly elevated from the ground, or other situation where wet will not penetrate to it. And placing itself in the spot it intends to occupy, it again rests for some hours.

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It then prepares to construct the girt for holding the pupa. For doing this work it requires to have a secure foothold, for it must not make a misstep and fall as it sometimes does when it is wandering around. It accordingly proceeds to cover the spot it has selected with a carpet of silken threads. It appears to be the constant habit of these worms to place such a carpet wherever they tarry for a day or more, although I do not see this fact noticed by any writer. And being now grown to a larger size, with a more arduous labor to perform, a more densely woven and substantial fabric is constructed than on previous occasions. The worm finishes this work by spinning upon the lower part of the mat a little round wad or hillock of threads, which is frequently of a conical form and pointed at its apex.

The worm is industriously occupied one or two hours in constructing this carpet and the little wad at its lower end. As soon as this work is finished it turns around with its head upward, and straightening itself on the mat, it moves the tip end of its body around, until it finds the little elevated wad. This it grasps between the hind pair of its feet, securely fastening their hooks into it. And with the feet along the middle of its body it also clings to the mat. It thus stands perfectly secure from falling, with the feet at the fore part of its body disengaged.

Without any pause in its work it now proceeds to spin the girt around its body. This curious operation it will be difficult to describe so clearly as to make it easily comprehended by the reader. The worm has no sooner fastened its hind pairs of feet to the mat of threads it has spun and straightened itself, than it begins to bend the fore part of its body around, bringing its head backward to near the middle of one side or the other. Put thus upon the stretch, the anterior half of the body becomes lengthened and more slender than the hind part, and so very pliant and flexible that the worm is able to double it together in every direction.

And now turning its head backward to one side, it applies its mouth to the surface on which it is standing, near the anterior pair of thick fleshy prolegs, sometimes in a line with these legs, sometimes a little back of them. It there fastens the end of a thread of silk which it spins from its mouth. It now requires to turn over, in order to carry this thread over its back and fasten it on the opposite side of its body. It accomplishes this in a very peculiar and truly remarkable manner. Releasing its anterior feet from their hold and keeping its body doubled together, it is able to carry its head and the double part of its body up over its back and down upon the opposite side, all this time keep-

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ing the crown of the head and top of the neck inward, face to face with the body, whilst the mouth, the breast and anterior legs face outward. It here fastens the other end of the thread, applying its mouth to the surface at several different points to render the attachment secure, a minute or more being occupied in turning from one side to the other and fastening the thread. It then turns back again, spinning a second thread in contact with the first, and fastening its end at the same point where the first thread was commenced.

It does not spin this thread from the forward extremity of its head. Its mouth is turned downward toward its breast, so far that the threads which have been spun pass across the throat and shoulders of the worm when it is turning over, the neck as well as the middle of the body being inclosed in the girt, whereby both the head and the posterior half of the worm are upon the hind side of the girt, and the remainder of the body, doubled into a half circle, is upon the fore side.

In this manner the worm carries its mouth from one side of the body to the other, each time adding another thread to the girt, until it has formed a skein of threads of sufficient strength to hold its body securely suspended. A much stronger girt is probably formed to hold the pupa through the winter than to sustain it only a week or two in the summer. Reaumur supposes there are about fifty threads in the girt, he having observed thirty-eight spun, and about a dozen had been spun before he began the count. In one instance which I observed, the worm placed but twenty-one threads in its girt, and was occupied twenty minutes in spinning and fastening this number. In another instance thirty threads were spun, the worm being engaged thirty-five minutes in the work. And both these girts were for winter pupæ. These facts render it evident that the number of threads in the girts is extremely variable.

When the girt is finished the worm requires to withdraw its head and neck from it. This is quite a nice operation; for if it should draw its head directly forward out of the loop, it would incur a risk of separating and drawing apart the threads in the bundle, and would probably break asunder some of the threads thus separated. To avoid any such casualty the worm first retracts its head into its neck as far as it can, and then bends it inward, crowding it against and under the side of the body, farther and farther, until the girt slips off from it. This curious expedient will be better understood by the reader from a familiar illustration. If he holds the fore finger of one hand straight and hooks the fore finger of the other hand around it, to free

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the straight finger, he can draw it directly out from the hook, or he can bend it together, farther and farther, until it slips out. It is in a manner analogous to this latter that the worm slips its head and neck out from the girt without any risk of breaking the threads or parting them asunder.

Immediately upon the release of its head it usually bends and brings its mouth to one end of the girt, placing numerous short threads there, to fasten it more securely. It then strengthens the other end in the same manner. And now having nothing more to do, it straightens and composes itself to rest. Its body lies quite loose in the girt. But it now contracts and soon becomes so thickened as to fill the girt. Retaining the same form, color and marks that it has previously had, except that it is one-fourth of an inch shorter, it remains at rest in the loop, sometimes only eighteen or twenty but usually thirty hours before changing to its pupa form.

Why does this insect take such care to construct this loop and subject itself to the arduous labor which its fabrication requires? It is not at all essential that the pupa should be suspended in this manner. Quite a number of pupæ that were gathered in autumn from the under side of the railing of my garden fence, were dropped promiscuously into a cup, in which they laid neglected, in doors, through the winter, the cup being occasionally inspected and shaken, rolling its contents about from side to side. And now, at the end of four months, nine butterflies have come from these pupæ within the past two days, and I judge half of them will hatch. If they had been carefully detached and gently laid upon some dry, soft bedding, with their backs downward, without being further disturbed, I make no doubt they would all have lived and completed their transformations. It thus appears that the loop has no further design than to hold the pupa securely in a dry, clean, airy situation.

When the change to the pupa form approaches, the body becomes thicker anteriorly and its color fades to dull yellowish green. The breathing pores appear as small black dots, each inclosed in an elliptic dull yellow spot; and slightly above them a new mark, a dull white line becomes quite distinct, extending from a little forward of the loop backward nearly to the tip. Dull pale purplish stains appear upon the skin, this color sometimes forming a wavy streak on each side of the back of the second and third rings. The second ring becomes still more distended by the pressure from within, stretching it to double the length of the rings next it on each side. The suture between the head and the first ring is ever and anon put upon the

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stretch, and in its upper part a slender silvery line is at times visible; and subsequently the skin here parts asunder and the glossy green surface of the pupa becomes perceptible in this cleft, which opens when the parts are put upon the stretch and closes when the pressure beneath relaxes.

And now all forward of the loop becomes strongly pressed upon from within and is much distorted and its color changed to very dark purplish, dingy and livid. This steady, strong pressure from within continues ten or fifteen minutes. At length the skin on top of the second ring suddenly parts asunder its whole length and the glossy surface of the pupa is crowded strongly upward in this elliptic opening. At the same time the top of the head opens apart; and at this moment there is a strong constriction forming a narrow belt around the neck; but with the outward pressure before and behind it, this first ring now parts asunder, and the whole anterior part of the pupa rises out of the opened larva skin, which slips downward from off this fore end of the pupa, the edge of the old skin at this moment extending from the back a little forward of the loop, diagonally forward and downward upon each side. The skin is next to be slipped backward out of the loop. This is accomplished by the pupa contracting and elongating its body a few times and simultaneously wriggling itself from side to side. These motions crowd the very thin film of skin rapidly backward, out from the loop and onward toward the tip. Back of the loop the pupa bulges out as it is released, little by little, from the constriction of the larva skin, and this abrupt enlargement pushes against and aids to crowd the skin backward, step by step, each time the pupa elongates itself. It is principally by a vermicular motion, a succession of contractions and elongations, that the abdomen of the pupa appears to crawl out from the larva skin, the process resembling an earth worm (*Lumbricus*) crawling out from its hole in the ground. The skin as it is crowded back becomes wrinkled into little plaits and folds. It is pushed back farther and farther, until it finally forms a crumpled soft gray mass of thin membrane and hairs around the tip of the body.

The last act of this metamorphosis is very curious. The pupa is held only by the loop around its middle and the tip of its body imbedded in the crumpled larva skin which remains fastened to the little hillock of threads by the hooks which belonged to the hind feet. The pupa now, by contracting, draws the end of its body out of the crumpled mass of skin, and is thereupon held in place by the loop alone. Its body ends in a pair of soft pincers, and it is wonderful to

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observe how dexterously as soon as these pincers are drawn out from the mass of old skin they pass back over this mass, and then bending inward vigorously push the mass forward and briskly feel around its farther side, till they find the little hillock of threads and instantly grasp it firmly. But the crumpled mass of skin and hairs crowds against and discommodes the hind part of the body. And how can the pupa relieve itself from this discomfort, having no mouth, no feet, wherewith to dislodge the mass and move it aside? The expedient to which it resorts is most singular and admirable. Immediately as the curved tip fastens to the little hillock of silken threads a brisk circular motion of the body commences, like that of a pestle carried around and around in a mortar; not a semi-circular motion, as some authors have stated. Hereby the old skin is pressed against at every turn and is gradually broken from its attachments and finally drops to the ground.

The change now described takes place with great rapidity. Reaumur terms it the affair of a moment. From the opening of the skin on the back of the neck till the detachment and fall of the crumpled mass of old skin, it has been five minutes, in two instances in which I have noticed the time.

It will be observed by those who are versed in what has been published on this subject, that my recital of the manner in which the pupa releases the hind part of its body, from the larva skin is quite different from that of Reaumur, our principal authority on this subject hitherto. The observations of this distinguished philosopher and naturalist are so accurate and he describes them with such clearness that they have justly been universally confided in. And probably no one since his day has investigated this metamorphosis of the turnip butterfly, from deeming his history of it to comprise all the facts and to be perfectly authentic.

According to Reaumur's account, when the larva skin has been pushed back so far as to cover only about one-third of the length of the pupa, the insect ceases to shorten and lengthen itself, it being more convenient for it to directly withdraw the extremity of the pupa, and then push it back along the outside of the empty larva skin till it reaches the little cone or hillock of silk threads, into which it fixes the minute hooks at the extremity of the tail. We have already seen it is the habit of the larva when molting to draw the hind part of its body out of the old skin, in much the same manner that is stated of the pupa, accomplishing this by means of its three anterior pairs of feet. But the pupa having no feet or other external

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members, I know not how it can draw the end of its body out of the larva skin, except by shortening it, although Reaumur says it has ceased to shorten and lengthen itself. And several considerations seem to render it wholly impossible for the pupa to release the end of its body in the manner stated. Hanging as it does closely girt about by a loop around its middle, its body cannot be moved forward a third of its length without breaking the loop. The loop it should be observed is more or less imbedded in and glued to the surface, whereby the releasing of the hind end from the larva skin in the manner stated must be effected wholly by the half of the body back of the loop. This half of the body is three-eighths of an inch long, with two-thirds of this length covered by the larva skin with its tip fastened to the little hillock of silk threads; being thus situated I know not how it can draw itself out of the larva skin except this half of the body shortens itself to one-third of its length, and this it is obviously incapable of doing. But it is unnecessary to pursue this subject further. Suffice it to say that with Reaumur's statement in my thoughts and my attention fixed upon what was taking place, I have distinctly seen the vermicular motion continue, the body contracting and lengthening alternately and crowding the larva skin backward, further and further, until all the segments of the body except the last were released. And how Reaumur came to fall into the error it thus appears he has done is unaccountable to me.

The pupæ are three-quarters of an inch long, and about one-fourth as thick. They are quite rough and uneven anteriorly, with projecting ridges and angular points on the back, and the head prolonged into a tapering horn. In their color they are variable as the chameleon, the same pupa sometimes changing to a wholly different color in twenty-four hours. Is their color influenced by that of the surface on which they are placed? A worm which I confined in a stone jar, which was dark-brown inside, girt itself to this surface, and changed to one of the darkest colored pupæ I have seen. They are frequently green, or bluish-green when they have newly entered the pupa state, but this color fades after a time. Others are flesh-colored. Others are brown, often of a pale umber tint. Their most common color is gray, usually pale or ash gray, and they are freckled with numerous black dots. When the time is near for them to give out the butterfly the wing-sheaths become bright yellow, and show also the black spots of the wings, whereby we are able to ascertain the sex of the butterfly some weeks previous to its birth.

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These pupæ vary somewhat in their size, but are commonly 0.75 long, 0.20 broad, and 0.20 high. They are divided into thirteen segments, by transverse sutures which are for the most part quite distinct. On the back, which is downward as the pupa reposes suspended in its loop, the first suture crosses the anterior part of the elevated nose-like protuberance, frequently making a slight notch therein. The second segment or prothorax case is large and strongly elevated in the middle, forming the nose-like prominence just mentioned. Often a slight notch in the hind part of this prominence shows the suture between this segment and the third, which is short, and the suture between it and the still shorter fourth segment is quite faint. But this fourth segment is readily recognized by the loop which passes across its middle. The fifth or first abdominal segment is quite distinct and equals both the preceding segments in its length; and on each side it is elevated into a compressed keel-like edge, the anterior part of which projects up in an obtuse angular point. The sixth segment is still more elevated on each side, the edge jutting up into a sharp point or angle. The following segments are plainly marked by conspicuous sutures. They on the back are roof-shaped, with an elevated line along the middle, and another, less prominent, along each side. On the under side these segments are rounded, forming a half cone.

Its colors are too variable and evanescent to admit of an exact description. When it has newly entered the pupa state it is frequently bright green, with a bright yellow line along the middle of the back and a white line on each side, and some black marks and numerous dots. Of these colors the last only remains, the others fading away, and the pupa usually becomes dull gray, marked with black as follows: A stripe on each side of the conical horn in front; a spot on the apex of the nose-like prominence; a spot on the angular points on each side of the fifth and sixth segments; numerous small dots symmetrically placed, the more conspicuous ones being a row along the middle of the back, placed one at the anterior edge of each abdominal segment; a lateral row of smaller ones, placed on the anterior angles of the same segments; four small ones in a transverse row across the middle of the sixth segment, and six in a similar row on the seventh segment; numerous fine dots on the veins of the wing-sheaths, and a row of larger ones alternating with the tips of the veins.

In summer this insect remains in its pupa state sometimes only a week. Therefore, as it continues about a week in the egg, and the larva completes its growth in a fortnight, and then reposes two or three days suspended in its loop, these cabbage worms can grow up to their perfect form in one month from the time the eggs are laid. The duration of this chrysalis state, however, is extremely variable. This is the more remarkable, as the larva is so constant in completing its growth in fourteen days. Joseph L'Admiral, long ago, published the dates when five of these cabbage worms took on their pupa form, and when these pupæ gave out the butterflies. I have completed similar observations in four instances, having several others still in hand to become completed the coming season. These observed instances, combined, form an interesting table, showing how very irregular is the duration of the chrysalis state in this species, no other insect within my knowledge being thus erratic. Each

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of my observations began in August, those of L'Admiral, in July and September.

Table Showing the Duration of the Pupa State at Different Dates.

Pupa state began.		Butterfly came out.		Pupa state lasted.
July	8.....	July	19.....	11 days.
"	20.....	August	5.....	16 "
August	19.....	"	26.....	7 "
"	21.....	December	8.....	109 "
"	22.....	September	2.....	11 "
"	29.....	"	7.....	9 "
September	4.....	"	23.....	19 "
"	5.....	May	28.....	265 "
"	16.....	April	1.....	197 "

Its change from the pupa to the perfect state is in no respect different from that of the white butterfly, narrated on a preceding page.

From the other white cabbage butterflies this species is distinguished by having the fore wings blackish at their tips and with a round black spot in the middle slightly beyond the center, the females having a smaller second spot between this one and the inner edge; and both sexes having a small black spot on the outer edge of the hind wings a little beyond the middle; its size also, measured from tip to tip of the opened wings, being two inches, but frequently varying to a quarter of an inch smaller or larger than this, the larger ones being females.

The head is coated over with straight white and black hairs of different lengths, the black ones less numerous on the under side. The eyes are large, protuberant and hemispherical; in the living specimen grayish green, with four rows of movable black spots, the central spot being of a deeper or coal black color; in the dead specimen dull brown and without spots. The antennæ are 0.40 long, and composed of thirty joints, which are shorter at each end than in the middle. They are slender and thread-like, with the tips enlarged into a knob of an elongated egg-shaped form with the larger end outward. Their colors are prettily arranged in new and unrubbed specimens, the outer and under sides being white; on the upper side a continuous black line; on the inner side a row of long oval dark brown spots, one on each joint extending from its base nearly to the tip; these spots separated from the black line above by a slender white line, which is widened toward the apex of each joint, and there sends downward a transverse band connecting this white line with the white under side. The knob is flattened or spoon-shaped and black on the concave inner side, white on the lower edge and outer side; the upper part of this side being sprinkled with black scales which sometimes form bands of this color; the tips pale yellow. The thorax is black and clothed with soft hairs of a white or bluish white color. The abdomen is black and covered with white appressed scales, less dense

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upon the back; its under side white and coated with white scales. The legs are covered with white scales, and the under side of the thighs with white hairs; and there is frequently a black stripe on the thighs and one or two slender black lines on the shanks and feet. The wings are white and at their bases dusted more or less with black scales. The fore wings frequently have black scales sprinkled along their outer or costal border its whole length. At their tips is a large triangular grayish black spot, which is longer on the outer than on the hind side, and on its inner side straightish, frequently with a concavity toward its inner end. In the female this spot is larger, but effaced on its inner end, whereby it has more of a squarish than a triangular form. Slightly beyond the center of these wings is a large black dot or round spot; and between this and the inner edge, in the female, is a second spot, which is usually smaller and less regular in its form, with its edges more indefinite. And in this sex is frequently a faint gray streak on the inner border of these wings, extending from opposite the inner spot forward toward the base. The hind wings in both sexes have a black spot on the outer margin a little back of the middle, which is smaller than those on the upper wings, and its edges indefinite. On the under side, the fore wings are white and sprinkled with black scales at the base and along the outer border sometimes to the middle. Along the inner side of the rib vein toward the base is a broad stain of yellow, more distinct in the females. The tips are pale yellow; and in both sexes here are two black spots, corresponding with those on the upper side in the female, but commonly smaller. The hind wings are pale yellow, and dusted over with small black scales, which are more numerous toward the base; the outer edge is brighter yellow near the base; and no vestiges of the black spot of the upper side are here visible in either sex.

These butterflies are liable to vary greatly in their markings, the spots being larger or smaller, coal black or pale, sometimes quite small and dim, and sometimes one and another of them totally disappearing. In the south-eastern part of Europe, a small variety occurs in which all the spots are wanting except that on the upper side of the fore wings. This has been treated by Hubner as a distinct species, under the name *P. Ergane.*

Another variety, also small in size and coming out earlier than the others appear, having the bases of the wings black, the tips of the fore pair slightly, if at all, blackish, the second spot on these wings double or composed of two small dots, and the under side of the hind wings very densely dusted over with black scales, was long regarded as a distinct species, named *P. Metra* by Stephens. Among some late pupæ, kept in a warm room the present winter, one has given me a butterfly of this variety.

Westwood says: "Some females have the upper side dirty pale buff." I have not met with any in this country thus colored. Curtis states that he has a male "which has all the wings of a bright yellow color." I possess two specimens of this kind, both as deep yellow, and nearly the same tint as our common yellow butterfly, *Colias Philodice.* These both came from larvæ which, when nearly grown, had been placed in boxes with some leaves on which to feed and were

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afterward forgotten, and completed their transformations thus closely inclosed. It would hence appear that seclusion from the light tends to produce this yellow variety.

This species is very common in all the countries of Europe, from Lapland to the Mediterranean. Boisduval states that it also inhabits Barbary, Egypt, Siberia, Asia Minor and Cashmere.

In a collection received from the late M. S. Culbertson, D. D., Missionary of the Presbyterian Board at Shanghai, China, are a dozen specimens which present such slight and unessential differences that I cannot deem them anything else than a local variety of this species. In the males the spot at tip of the fore wings is larger, extending the same distance on the hind side of the wing that it does on the costal side, and is darker colored from being less dusted with scales, and these scales are sky blue instead of white, and are most numerous along the costal side of the spot. The second spot on the under side has opposite it on the upper side a few black scales forming a faint cloud in most of the examples. On their under side the fore wings are more broadly stained with sulphur yellow on their outer base, this stain being faintly prolonged along the costa to the yellow spot at the tip; and upon the inner side of this yellow stain is a faint brown or smoky streak, formed by a cluster of black scales in the hind part of the discoidal cell toward its outer side; this streak being distinct and quite obvious to the eye in each of these examples, yet in none of my American or European specimens do I perceive any traces of it. The tips of the fore wings beneath, and the surface of the hind wings are pale ochre and brighter yellow than in our insects, and the hind wings are less dusted with black scales, these scales being most dense in the inner half of the discoidal cell, whilst the outer part of this cell and all the hind half of the wing is nearly or quite destitute of them. In the female the black spot on the tip of the fore wings is larger, more broad and more nearly square than in our insects.

This new insect, on this side of the Atlantic, is currently termed the cabbage worm. In Europe, everywhere in company with it is another very similar but larger species, which is called the cabbage butterfly, its scientific name also being *Pieris Brassicæ;* and this smaller species is distinguished by the names small white butterfly, small white garden butterfly, small white cabbage butterfly, and in conformity with its scientific name it is also termed the turnip butterfly. This last we regard as its most appropriate name, its larva being equally common on the leaves of the turnip and ruta-baga as on those of the cabbage; though as they do but little injury to the tur-

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nip crop their presence upon it is noticed much less than on the cabbage.

It received its scientific name from Linnæus, first in his Fauna of Sweden, published in 1746, where, and in his subsequent works, he termed it *Papilio* (*Danai Candidi*) *Rapæ*, the last or specific name being the old Latin and also the botanical name of the turnip. And by this name only it has been known to naturalists from that day to this, it having escaped from becoming overloaded with synonyms as are so many of the common European insects. Although a multitude of writers have noticed it, it is a pleasure to see its several varieties have been mistaken and proposed as species only in two or three instances.

A prominent trait of this insect, is its quiet peaceful disposition. The larvæ avoid any intrusion upon each other, and upon other insects. Each one appears to feel it has a right to the leaf on which it finds itself placed, and is reluctant to forsake it and go to another leaf, as if fearful it might thereby be encroaching on the domain of another. Whoever has fed these worms, in cages, will have noticed that when fresh leaves are supplied to them, they do not begin to feed on them until the leaf they have been eating is consumed, or has become so stale and dried that it is no longer edible. The young worms are particularly timorous in this respect. When a small piece containing a young worm is cut out from a leaf, it soon becomes so dry and hard that the worm is unable to eat it, yet it appears to feel it has no right to any other leaf than that. This dried fragment, with the worm standing upon it, being placed upon a fresh leaf, the worm, pressed with hunger, after awhile crawls hesitatingly to the edge, and reaching off begins to feed upon the fresh leaf. But if any slight jar or other motion occurs, it instantly draws back, as if it felt guilty of pilfering a dinner which belonged to another, and it stealthily glides to the middle of the dry fragment, seemingly to make it appear that it has not been intruding outside of its own domain.

If an aphis is located on the under side of a leaf on which a worm is feeding, the latter avoids encroaching upon, or in any way molesting it, leaving untouched a portion of the leaf a half inch or more in extent around the aphis.

When a worm is jostled or otherwise annoyed by another worm, an aphis, fly or insect wandering about upon the leaf, it jerks its head violently from side to side, which usually has the effect of turning the intruder away. But if this resort fails, the worm stoically submits, and without further resistance allows the other to crowd against

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it, or mount over its back. It never attempts to bite another insect or larva, however much it is molested by it.

Another trait of this cabbage worm which merits to be particularly noticed, is its strong vitality, its remarkable hardiness and tenacity of life. Several facts already stated show that both the larvæ and the pupæ survive such disasters and mistreatment as would be deemed fatal to them. And I may further add to what has been related, that water does not appear to drown these worms, and freezing does not appear to kill them. Upon a chilly day, in the middle of November, meeting with a half grown worm which appeared to be so torpid with cold that it was unable to crawl, I placed it in a concavity in a cabbage leaf which was lying upon the ground, proposing to observe it further. A cold rain coming on, filled with water the hollow in the leaf, in which this worm was lying, and the following night this water froze to ice. Going to it the next morning, and finding the worm imbedded inside the solid ice, I placed it upon a dry leaf in the sunshine, where the ice gradually melted, and the worm becoming dry was found to be alive. Bringing it in doors, its neck was found to be swollen, showing that it was preparing to cast off its old skin, and would therefore remain quiescent until this was accomplished. It, however, turned its head around whenever it was touched, and the next night it changed its skin, thus showing that it survived an immersion of eight or ten hours in water of icy coldness, and a freezing inside of a cake of ice.

Being thus strongly tenacious of life, those offensive and poisonous substances which are repulsive and fatal to many larvæ, will have little if any effect upon these worms.

Most fortunately, nature has provided many natural enemies to these cabbage butterflies, whereby in their native haunts they are constantly preyed upon and restrained from becoming unduly numerous. But having newly arrived on our continent, they find they are here released from their most inveterate destroyers, and are therefore able to multiply without check or hindrance. Sooner or later, however, these foreign destroyers will follow them to our shores, or some of our American predaceous insects will learn to assail and prey upon them, whereby they will cease to be the formidable evil which they now are.

The birds, by European writers, are ranked as most important destroyers of the larvæ of this and the larger cabbage butterfly. Mr. Haworth states that "small birds destroy incredible numbers of them as food, and should be encourged. I once observed a titmouse (*Parus*

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major) take five or six large ones to its nest in a very few minutes. In inclosed gardens, sea-gulls, with their wings cut, are of infinite service. I had one eight years, that lived entirely all the while upon the insects, slugs and worms which he found in the garden. Poultry, of any sort, will soon clear a piece of ground."

But the most efficient enemies of these butterflies are their internal parasites. These are mostly very small ichneumon flies, resembling winged ants. The most common of these parasites is the *Microgaster glomeratus*. This minute fly punctures the skin of the cabbage worm in thirty to sixty places, inserting an egg in each puncture, from which a maggot hatches, which feeds internally upon the worm, weakening it to such an extent that it dies immediately after these maggots have got their growth and issued from it.

Another important parasite is the *Pteromalus puparum*, which, on finding a pupa which has newly entered this state, places upon its surface her whole stock of eggs, to the number of two or three hundred. And the exceedingly minute maggots which hatch from these eggs, eat into the pupa, and there complete their growth and transformations in about a fortnight, the tiny flies then coming out in a swarm, hovering and dancing around the dead pupa until the sexes have paired, when the females fly away to find new pupæ on which to place their eggs.

Another ichneumon fly is much larger, and distributes its eggs one to each pupa. Still, another exceedingly minute fly is reared in the eggs of these butterflies.

As yet, I have met with no internal parasites infesting these larvæ or pupæ in this country. Mr. Provansher, of Quebec, however, has obtained a two-winged fly from one of the pupæ, which resembles one of our common flesh flies.

Other predaceous insects and arachnidans slay and feed upon these cabbage worms, and some of these slaughter such numbers that they are nearly as efficient destroyers as are their parasitic enemies. On the first of September, upon a plant which had nine leaves, the largest ones being five or six inches broad, I counted seventy-one eggs. As the plant could not sustain one-third of this number of worms, I let these eggs remain undisturbed, to observe their subsequent history. Five days afterward, there were on this plant twenty infant worms, and only thirteen eggs. Thus thirty-eight eggs, more than half of the previous number, had disappeared. On the under side of the leaves, in several places, small holes, two or three contiguous to each other, were eaten into the pulp of the leaf, showing that young

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worms a day or two old had been feeding in these places. The query therefore arose, what had destroyed these worms? On coming to inspect the leaves more particularly the agent in this destruction was quite evident. Small spiders were observed inhabiting the under side of the leaves, four to eight in number upon the larger lower leaves, some of them standing openly exposed upon the leaf, others nestled under a slight web. They had apparently been attracted to this situation to feed upon these worms, and one of them was seen a few days afterward in the act of eating a small worm which it had killed. By slaughtering such numbers of these worms immediately after they hatch from the eggs and before they have eaten the cabbage leaves so as to occasion any damage to them, they render us an important service.

As seen upon the cabbage leaves these spiders are one-tenth of an inch in length. They are of a waxy white color, smooth and glossy, with two black parallel lines along the middle of the fore body, the lines united at their hind end. The abdomen or hind body is globular and usually of a yellowish tinge, with a broad stripe of opake milk-white along the middle of the back and a narrower one on each side. They have eight small black glass-like eyes in front, placed in two rows. The four middle ones are placed at the angles of a square and the two outer ones on each side are united together. They will thus pertain to the genus *Theridion*. This species does not appear to have been described either by Prof. Hentz or Baron Walcknaer. I meet with it so common upon the under side of cabbage leaves that, although it may hereafter be found equally common in other situations, it may appropriately be termed the cabbage spider, *Theridion Brassicæ*. It grows to nearly double the size above stated, and then varies somewhat from the markings it presents when young, as noticed in the following description.

The Cabbage Spider, *Theridion Brassicæ*, grows to 0.18 in length, and is of a waxy white color, with two black parallel lines along the middle of its fore body, ending anteriorly near the eyes, and confluent at their hind ends. The abdomen is globular, and in young specimens shows a stripe of opake milk-white upon the middle of the back and one upon each side; that upon the back being broad anteriorly and tapering to a point at its hind end, its anterior half having a waxy white line along the middle, and a transverse line of the same color crossing the stripe and slightly separating its forward end from the remainder, this stripe being also three-lobed on each side, the middle lobe longest; the lateral stripes also having similar but smaller lobes on their upper side, the ends of which project into the sinuses between the lobes of the dorsal stripe. In adult specimens the whole upper side is opake milk-white, which color on the sides is broken into minute dots. The under side is waxy white, with a black dot on each side of the tip, and a third one on the base.

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The legs are long and slender, the first pair being longest and the second pair next, the third being slightly shorter than the fourth pair. They are ornamented with a a black band on the tips of all the shanks except the third pair.

The female incloses her eggs in a globular ball of a white color, two-tenths of an inch in diameter.

The UNDERLEAF SPIDER, *Theridion hypophyllum*. Another spider, a pretty little species, occurs on the under side of the same leaves with the preceding, and is about half as numerous. It probably feeds upon the young cabbage worms, but I have no positive evidence that it does so. Though it is no larger than the preceding species, it is much more conspicuous from its bright colors. Its forebody and thighs are bright cherry red, its globular abdomen is black and shining, and four punctures or impressed points are seen upon the forepart of its back, at the angles of a square, whereof the hind side is longest. Its legs are black or blackish, and more short and thick than in the foregoing species. The chelicers of the male are large and black.

This is a common species, and inhabits the under side of the leaves of forest trees, as well as those of garden vegetables. I have also met with it repeatedly on the surface of the snow in forests, on mild days in winter. On the leaves of trees, I have noticed it feeding on plant lice.

This lovely little spider I have sometimes thought might perhaps be a variety of the *Theridion roscidum* of Prof. Hentz. It, however, is quite constant in its colors, and I have never met with a specimen having spots on the abdomen, as is called for by the description of that species.

These cabbage worms are also destroyed by some of the rapacious bugs of the order Hemiptera, insects which are commonly recognized by the flattened form of their bodies, and the disgusting bed-bug odor which they emit. Though most of these bugs subsist upon the juices of vegetables, several of the species, with their sharp needle-like beaks, pierce the larvæ of other insects, and suck out the fluid contents of their bodies. Some of these predaceous bugs become residents of the cabbage patch, upon discovering the ample supply of food which is there presented them. One of them, in its larva, its pupa or its perfect state, may occasionally be seen standing on the edge of a cabbage leaf, with a worm hanging downward from its beak, dead, flaccid and doubled together. It is occupied about six hours in sucking the fluids of one of these large worms, and this meal usually suffices it for forty-eight hours, after which another worm becomes its victim.

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The important question remains to be considered; how can we most successfully combat this new enemy and rescue our cabbage crop from the destruction which appears to be impending over it? And the thought which first occurs in connection with this inquiry is, that having received this evil from Europe we can from thence be informed of its best remedies, aware that during the centuries of experience they have there had with this enemy every measure for its destruction which promises to be of value will no doubt have been fully tested, and those which are most efficacious will have been conclusively ascertained.

And we find that about the only measure recommended by European writers is, searching out, capturing and destroying the insect in all the different stages of its growth. Kollar says: "The best way to destroy them is picking off and killing the caterpillars, as well as the pupæ, the latter being found attached to adjacent trees, hedges and walls." Duponchel, in his Iconograph of Caterpillars, vol. 1, p. 50, says the most efficacious measure for destroying them will be for the gardeners to employ their idle children in capturing for the slaughter all the white butterflies which are flying around their cabbages, as these are mostly females seeking places to lay their eggs; and slaying one female before she begins to lay, we destroy one entire generation of caterpillars, composed perhaps of a hundred to a hundred and fifty individuals. He also recommends searching for and destroying the eggs and the pupæ.

Setting children to capturing all the butterflies that come around the plat of cabbages, stimulating them to increased diligence by a trifling reward for a certain number caught, I regard as the most effectual mode of keeping the crop free from this enemy. They should be furnished with a net, a bag made of musquito netting or some similar fabric, about three feet long and eighteen inches diameter, its mouth sewed to a hoop of stout wire with the ends securely fastened to a handle some four feet long. With such a net the butterflies will be readily caught, as they are commonly slow in their flight.

Many of the pupæ may be entrapped by placing pieces of boards between the rows of cabbages, elevated two or three inches above the ground, to the under side of which numbers will resort to pass this stage of their lives. A half dozen boxes open at the bottom and top, used for protecting hills of cucumbers from the striped yellow beetle, having been left lying upon their sides three yards distant from a row of ruta-bagas, were found with fifteen pupæ in them, showing that

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the insect resorts to the nearest covert it can find, in which to pass its pupa state.

To search the cabbage leaves over and with scissors cut asunder every worm that can be found, repeating this search so often as is required, is a task so formidable, that many persons, instead thereof, have dusted their plants with some powder or sprinkled them with some solution, hoping hereby to destroy at least a portion of the worms or banish them from the plants. But, I am informed by several persons, that of the many substances of which they have thus made trial, not one has appeared to possess any efficacy. I notice, however, that my esteemed friend, Mr. Riley, states that "white hellebore will kill the worms if sprinkled on to them." From the experiments I had made with this substance on several different larvæ, I had supposed it would have no effect upon these cabbage worms. Whilst it is certain and immediate death to the larvæ of different species of the saw-flies (*Tenthredinidæ*), the larvæ of the Lepidoptera appear to be unaffected by it. Even when the latter are forced to eat it largely with their food, though its acridity produces purgation and violent inflammation of the intestines, they always recover from this severe illness. Mr. Riley's statement, however, being so positive, has induced me to make a trial of this substance upon these worms. Hellebore, which had a few weeks before killed every currant worm where it had been applied, and was thus known to be a good article, was dusted upon a cabbage worm till it was so coated therewith as to wholly hide its green color, except on the under side of its body. And I could not discover that the worm was in the least affected thereby. Crawling between the leaves in its cage, it in about three days had rubbed off all this powder, being no more discommoded by it, apparently, than if it had been road dust. As this and other poisonous substances have no effect on these worms, it seems hopeless that any remedy can be found, which, dusted upon the cabbages, will destroy them without destroying the cabbages also. And we are thus left to capturing the butterflies, and searching out their eggs, their larvæ and pupæ, and destroying them one by one, as our only resort for saving our cabbage crops from the ravages of this insect.

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REPORTS OF COUNTY SOCIETIES.

ALBANY.

The history of the Albany County Agricultural Society, for the past year is unchanged, so far as any advance to the agricultural interests of the county is concerned. Several meetings of the board of managers have been held during the year, but nothing beyond the holding of an annual exhibition has been acted upon or introduced in their management. There is little of encouragement in the affairs of the society, and until some enlightened ideas are instilled in the management (which seems almost impossible) but little better can be hoped for.

The annual exhibition was a success in every department. In the stock department, there were evident signs of an interest in the development of the best breeds; and although the exhibitors were few in number, the few give hopeful indications for the future. The farmers of our county are slow to adopt anything new, perhaps more so than many counties in the State; and there is no medium by which a change for the better can be more effective than well directed efforts of our society.

There was in the treasury at the commencement of the year $512.19, most of which was paid for cancelling old judgments against the society.

Officers, 1870: President, Wilfred Ramsey, Albany; Secretary, Thomas Bagley, Albany; Treasurer, D. V. S. Raynsford, New Scotland.

Receipts from all sources	$9,340 31
Total expenditures	9,199 52
Balance on hand	$140 79
Indebtedness	1,054 23

S. R. EARLS,
Secretary.

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ALLEGANY.

The twenty-fifth annual fair of the Allegany County Agricultural Society was held on the grounds of the society on the 5th and 6th of October last.

The display of horses and cattle was superior to that of any previous year; indeed, it was conceded by all in attendance, that every department was better filled than usual.

The exhibition of vegetables, fruit, grain, dairy products and domestic manufactures was very fine.

The annual address was delivered on the first day, by Hon. M. B. Champlain, of Cuba. The address was an excellent one, practical, eloquent, and full of valuable information and instruction; and excited great enthusiasm among the large number that listened to its delivery.

Balance on hand February 1st, 1869	$542 75
Receipts from all other sources subsequent to that time	1,201 34
Total	$1,743 09
Expenditures	1,742 88

The society is free from debt with fair grounds of nine acres paid for.

The annual meeting of the society was held on the 29th day of December last, and the following were elected officers for the year 1870: President, John T. Wright; Secretary, D. P. Richardson; Treasurer, George W. Thomas.

D. P. RICHARDSON,
Secretary.

BROOME.

The twelfth annual meeting convened at Whitney's Point, January 28th, 1869. The following officers were elected: William E. Taylor, President; E. D. Robinson, Treasurer; Milo B. Eldredge, Secretary.

James Richards, LL. D., delivered the annual address.

There was a meeting of the executive committee April 1st, at which it was resolved to hold a horticultural exhibition in Firemen's Hall on the first day of July; and the same was held, and a fine display of flowers, vegetables, honey, etc., was made, the receipts more than defraying the expenditures.

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An executive meeting was held June 5th, at which it was resolved to hold a plowing match in the town of Maine, on the 20th of September. This was duly held and a large number were present, and much interest manifested. A report will be found with the award of premiums at the fall fair.

At a meeting August 16th the standard of good plowing was fixed at eleven inches wide and seven inches deep. It was also resolved to build an additional shed for the protection of the mechanical department, fifty feet long, of sixteen feet broad, and double.

The officers labored assiduously up to the day of the fair to make it a success.

The annual fair was held on the grounds of the society in Binghamton, on Thursday and Friday, September 23d and 24th. The exhibition was large in nearly all the departments. The entries in the several classes of cattle comprised some very fine stock of the various breeds. H. F. Bronson exhibited two fine blood Devon cows which were perfect beauties. Samuel Bayless of Kirkwood, had some fine grade Alderneys on the grounds. Luther and Lewis Jennison of Union, each had excellent yards of cattle, etc., and James Cover of Binghamton, brought a string of six yoke of cattle, owned and worked on his farm. The exhibition of stallions, work and carriage horses was large, and comprised some beautiful animals. The mechanical department was filled. The exhibition of carriages, buggies, etc., being very full. Winters and Stafford, Stockwell and McMahon, Finley and L. W. Everett, having specimens on the grounds, showing the great advance made in that branch, in regard to ease, durability and elegance. Stoves were there in full blast, from which we had bread and potatoes, baked in the space of fifteen minutes. Jones' Scale Works had their celebrated 4,000 pound scale there, which took the first prize at the Elmira State fair, which will weigh so accurately, that a man weighed thereon, with and without an ordinary hat will make a variation in the scales. The Binghamton works also had specimens of their different scales. This department comprised many other articles which cannot be mentioned in our space. Agricultural hall was literally filled with the products of the farm and the garden, and it was remarked on every hand that a better display is rarely seen, and that the same department at the State fair was second to this. The display by C. Parsons of the asylum gardens was particularly worthy of mention on account of its extent and variety.

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The Wells Bros. of Lisle, had on exhibition a swarm of bees busily at work, and some hives, honey boxes, etc., which attracted a great deal of attention. Floral hall was completely empty with the exception of the display of apples which was very fine, and the various kinds of sewing machines with their work attracted the people. The address of Wm. H. Bushnell of New York, was an elegant, scholarly production, abounding in useful hints for the agriculturist and mechanic, and was listened to with marked attention by a large concourse of people.

The society depended solely upon agricultural and mechanical productions to bring out the people, and though the attendance was not as large as was hoped, yet a goodly number of earnest men and women were present, and no grumblings of being humbugged were heard.

A generous rivalry prevailed among the exhibitors, and the exhibition was productive of much good, and will undoubtedly stimulate our farmers and mechanics to renew efforts to excel; and above all, the influence, unlike most of the gatherings under the *name* of fairs, was productive of good feeling and morality.

Received from late treasurer		$8 25
" from other sources		530 25
" borrowed money		250 00
		$788 50

Expenditures:

Rent of ground	$250 00	
Premiums	425 25	
Buildings	110 00	
Other expenses	316 74	
		1,102 04
Balance		$318 54

MILO B. ELDREDGE,
Secretary.

CATTARAUGUS.

The twenty-eighth annual fair and cattle show of this society was held on the society's grounds, in Little Valley, the 20th, 21st and 22d of September last. Although the weather was not as favorable as might have been desired, still the exhibition was a creditable one, and may be regarded as a success in every particular. The number

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of people in attendance was far in excess of many previous fairs, and had it not been for the rain in the morning of the last day, the receipts would have been very much in advance of what they were. There were a large number of entries made, larger by far than the average for the last six or eight years, and the masses in attendance showed an increasing interest in matters pertaining to agriculture. The show of cattle was large and excellent in quality. The show of horses was good, both for carriage and draught. The exhibition of stallions was remarkably fine. The show of sheep would compare favorably with former exhibitions, being of all grades and kinds, of long, middling and fine wool. There was a good display of fruits and vegetables. The dairy products, as represented by the specimens on exhibition, were evidence of a steady improvement in that important department.

The articles exhibited in the domestic and fancy departments were very fine. The ladies, as usual, contributed generously to the display, and the large tent was well decorated and filled. The annual address was delivered on the afternoon of the third day, by Hon. Porter Sheldon, member of Congress from the thirty-first New York district, and was listened to by the people in attendance with marked attention and approbation.

A very great improvement has been made in the pecuniary condition of the farmers of this county within the last few years, perceptible in their dwellings and other farm improvements.

The financial condition of the society was never as good as at the present time, and, with careful and judicious management, I have no doubt this state of affairs will continue.

The receipts from all sources during the year were $1,863.01. Expenditures, $734.65, leaving a balance in the treasury on the 31st day of December, 1869, of $1,128.36.

The annual meeting of the society was held at Little Valley on the first Saturday in January, and the following persons were elected officers for 1870: President, John Manley, Little Valley; Secretary, Lambert S. Whitney, Little Valley; Treasurer, Enos C. Brooks, Little Valley.

HORACE S. HUNTLEY,
Secretary.

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CAYUGA.

The annual fair of the Cayuga County Agricultural Society was held at Auburn on the 21st, 22d and 23d of September, 1869. The fair did not vary in any material respect from the fairs of previous years. The stock exhibition, although not large, was of choice selection. The display of implements was large, as also that of fruits and vegetables. The attendance was good on each day. The receipts materially helped pay the indebtedness of the society's grounds, and other necessary expenses.

At the annual meeting on the 11th of December, the following persons were elected as officers for the ensuing year, viz.:

President, Allen D. Morgan, Auburn; Secretary, John G. Hosmer, Auburn; Treasurer, L. C. Mann, Auburn.

Respectfully,

A. B. HAMBLIN,
Secretary.

RECEIPTS.

1868.		
By balance on hand last statement		$350 52
By State appropriations, 1868		368 06
By donations by P. Shank		2 00
By cash S. C. R. R. Co., for use of grounds		300 00
1869.		
By rent of grounds		216 00
By memberships	$578 00	
By single admissions	747 42	
By seat admissions	42 20	
By stands and stalls	85 00	
By entry fees (trotting)	139 00	
		1,591 62
		$2,828 20
Premiums, etc		$2,414 90
Balance on hand		413 30
		$2,828 20

CHAUTAUQUA.

On the 28th, 29th and 30th of September, 1869, the Chautauqua County Agricultural Society, and the Chautauqua Farmers' and Mechanics' Union, held a union fair on the grounds of the last named society, at the village of Fredonia, in said county.

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During the fair it was voted that the next exhibition of the Chautauqua County Agricultural Society be held at Jamestown, in said county, and the following named officers were duly elected: President, Joel I. Hoyt, Jamestown; Secretary, John T. Wilson; Treasurer, A. Lowney.

During said fair there were received 1,421 entries. The receipts were as follows:

Rent of stands	$145 00
Tickets and entries	1,820 93
Total	$1,965 93

Expenses as follows:

In fitting up grounds, buildings, and other expenses	$495 87
Premiums	1,317 21
Leaving a balance of	152 85
Total	$1,965 93

JOHN L. RUSSELL,
Secretary.

CHEMUNG.

The State fair having been held in this county this year, it was not deemed advisable to hold a county fair. For this reason we are without the necessary statistics and data to render a report of the industrial interests of our county with that degree of accuracy and usefulness which we could desire. The year has been one of general prosperity. Seldom has the agriculturist been so amply rewarded. The yield of grass has been at least one-fourth larger than the average for years past. The crops of wheat, oats and barley have also exceeded the average of late years, according to the number of acres sown. Corn has not been as good, although fine crops have been raised, and nearly all planted on gravelly loam. An unusually wet spring prevented planting in proper season on our loamy ground, which constitutes the larger portion of the rolling and hilly part of the county. The quantity of butter manufactured is gradually increasing year by year, while the remunerative price obtained in market affords conclusive evidence that the quality is at least equal to any manufactured in the State. The Chemung county butter-

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makers have scarcely ever failed in carrying off the first prizes at our State fairs whenever they have brought their butter in competition. While this result is in no inconsiderable degree owing to the character of the soil, grass and food, yet it cannot be doubted but that the practical knowledge obtained by experience, aided by the best scientific appliances and intimate knowledge of the chemical qualities of milk and the manner of keeping it, has more to do in producing good butter. Our farmers are more fully beginning to comprehend the necessity of availing themselves of the scientific developments in agricultural chemistry, not only in the manufacture of butter, but in the adaptation of grains and cereals to soils; and but few who can command the means, will undertake to cultivate their lands without the aid of the best and latest improvements in agricultural implements.

While the farmer is realizing the benefits of the inventive genius applied to mechanism, the mechanic reaps a corresponding reward in the ready market found for every invention calculated to expedite and lighten the toils of the farm, thus exemplifying one of those cardinal principles of political economy, "division of labor."

Although we cannot charge the farmers of our county with great indifference to the prosperity of their society, yet we find not only here, but in neighboring counties, too much apathy existing among the members. The burdens, which are quite onerous, have to be borne by a few of the officers, while too many, also, seem to require some undue excitement at our annual fairs, as horse trotting or racing for money, to induce them to attend. Our two last fairs were successful without such appliances, a constitutional provision of our society having been inserted prohibiting them at the fairs. Could there be a general concert of action by county societies upon this subject, and our annual exhibitions confined to their legitimate objects, much good would be accomplished, and a more healthy, moral sentiment inculcated. Again, annual fairs have of late become liable to the charge of being "advertising mediums." While we cannot control the motive inducing exhibitors to bring their wares to our fairs, yet we should not lose sight of the primary objects of agricultural and mechanical societies: The friendly competition of home products, and of the farm and shop, the mutual interchange of practical experience in the productions of the soil, the different modes of cultivation, the manner of rearing stock, the proper succession of crops, the most advantageous and economical breeds of cattle, sheep and swine, adapted to the locality, and domestic economy. These we

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regard as among the legitimate objects of agricultural societies, and to further which annual exhibitions should be held.

The officers of the society are: A. R. Frost, President; De Witt C. Curtis, Secretary; S. T. Arnot, Treasurer.

DE WITT C. CURTIS,
Secretary.

CHENANGO.

The fourth annual horse fair connected with the Chenango County Agricultural Society was held on the society's grounds in Norwich, June 16th and 17th, 1869. There was a very good show of horses, but not as large as some previous years. The show of agricultural implements was very light. The weather during the fair was all we could desire, and there was a very good attendance.

The twenty-fourth annual exhibition of the society took place October 6th, 7th and 8th, 1869. We were favored with good weather and a large crowd. There was an increased interest manifested in the display of all kinds of stock, and the fact of our being obliged to make additional pens for stock after the opening of the exhibition, shows that our farmers have not lost all interest in the annual fair. There was a good display of agricultural implements, especially in the line of plows and cultivators.

While other departments were so well represented, Floral Hall was not entirely forgotten. The exhibition of sewing machines, of which there was quite a number, and of several different patents, formed a very interesting and important part of the exhibition. The dairy interest was well represented by some choice specimens of butter and cheese.

On the last day of the fair we were favored with an address from Oscar W. Johnson, Esq., of Chautauqua county, which was listened to by an uncommonly large audience with marked approval, and was pronounced by all who heard it one of the best agricultural addresses ever delivered before the society.

The season that has passed has been one particularly favorable to the agricultural interests of this county. Grass, which is our most important crop, was never better, and the dairyman has gathered a rich harvest. Oats, which for a number of years have been a very uncertain crop, were this year very heavy. Corn, owing to the backward spring, was very light, and a fine field of corn was seldom seen. Wheat was very good, but not up to last year

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The officers of the society for the year 1869 are: Grant B. Palmer, President; G. S. Mead, Secretary; C. R. Frink, Treasurer.

G. S. MEAD,
Secretary.

ANNUAL REPORT OF THE TREASURER OF THE CHENANGO COUNTY AGRICULTURAL SOCIETY FOR THE YEAR 1869:

June Fair, held June 16th and 17th, 1869.

Received for admissions	$486 50
subscriptions	161 00
from all other sources	10 61
from State	297 38
	$955 49

Paid premiums	$343 00
printing	33 00
rent of grounds	100 00
labor, band, feed, etc	72 11
salary of secretary and treasurer	30 00
debt of society, due 1868	62 18
Balance in hand	315 20
	$955 49

October Fair, 1869.

Received for membership	$582 00
for tickets	419 50
from all other sources	40 00
	$1,041 50

Paid premiums	$391 50
printing	102 50
rent of grounds	100 00
speaker	50 00
other expenses	231 87
salary of secretary and treasurer	50 00
Balance in hand	115 63
	$1,041 50

Aggregate Receipts for the year 1869.

June fair	$955 49
October fair	1,041 50
	$1,996 99

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Aggregate Expenditures.

June	$640 29
October	925 87
	$1,566 16
Cash balance on hand	430 83
	$1,996 99

Address of Oscar W. Johnson, Esq., of Fredonia, N. Y.

Fellow-citizens.—It is with pleasure that I have come, at your call, to greet old friends, and to behold once more the beauties of this valley. Twenty-five years ago, a boy, I came to this place, and here passed seven years of my life, at a time when nature and friends leave the most durable impress upon memory. To-day I can but think of the marvelous changes a quarter of a century has wrought. Nature meets me in her old familiar forms; the everlasting hills are here, the valley smiles with its ancient beauty, the river greets me with its old murmur, familiar trees wave their welcome, but the change is in men. Of those I remember as being old, all have gone to the grave. The middle-aged have become the venerable fathers, of whom but a few now linger on the shores of being. The children of that day have become the men and women who are now meeting the responsibilities and duties of life. Strange voices come from your pulpits, new faces are at your windows, vacant chairs are at many of your hearthstones; most of the old familiar faces are gone from your streets forever. I realize how noiselessly a generation, one by one, go down to the dead, and how quietly their successors take their places, until all life is changed. To me the changes of twenty-five years seem as the work of a moment; to you they have been scattered through the years. I can but allude for a moment to some of your dead: Dr. Mitchell, inseparably and honorably connected with the early history of this valley. Abial Cook, from whom I have heard as genuine and inspiring eloquence as ever fell from mortal lips. John Wait, with whom I studied my profession, who took me by the hand and helped me when I needed help; he was a model of true and generous manhood. Dr. Daniel Bellows, whose house was my home, a saint, who was ready and ripe for heaven long before he was summoned; he bore his cross and has received his crown. Elisha B. Smith, whose genial face comes back to me as it was before it was darkened by the shadows of battle. Henry M. Hyde, who for years struggled heroically for life, and professional eminence, and who

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yielded only to to the great conqueror. Nelson Pellett, the genial generous friend, who carried sunshine to every circle. Harvey Hubbard, whose intellect and attainment made him the pride of the valley, and who wove its beauty and its music into romance and song. Well may we say:

"The warmest of hearts is frozen,
The freest of hands is still,
And the gap in our picked and chosen,
The long years may not fill;"

Sherwood S. Merritt, so recently called away in the prime of life; I have a hundred times stood with him on the summit of the west hill, and seen the mists of the morning disappear, revealing the beauty of the valley and of the eastern hills; and we may hope that he now stands upon a loftier height, and looks upon a diviner beauty, which no mists shall ever dim.

The year has no gatherings which represent all the interests and resources of society so fully as annual fairs. They are for social intercourse; they are the holidays of labor in which every heart should beat with joy and gratitude to the Divine Being who crowns each year with fruitfulness, and who has promised us seed time and harvest forever. While you have the varied forms of animal life, the wealth of the shop, the ornaments of the home, the fruits of the field, the tree and the vine, yet all this is insignificant compared with this throng of life, this exhibition of humanity; for there is no light like that which beams from happy faces—no music like the kind greetings of the human voice.

* * * * * * * *

This region is peculiarly adapted to dairy purposes. You depend mainly upon grass, the most certain of all crops. Your nutritious grasses, the sweet waters that gush from your hill sides, your own skill, enables you to produce butter and cheese equal to any to be found in the markets of the world. This is the specialty to which this region is ever to be devoted. Your ability to produce an article which is at once a luxury and a necessity of life, is your wealth. It is an inheritance you can leave your posterity, and that cannot be destroyed save by some unlooked for convulsion of nature. The price of the products of the dairy is constantly to increase. The region that can produce the best, such as will bear shipment, such as wealth will have upon its tables, is comparatively small. The east, the west, the south, alike demand your products. The best dairy field of the republic is occupied, while the grain growing regions

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are comparatively untouched. The valley of the Mississippi can produce grain to feed one-half of the human family. There are not herds enough to keep down the grasses of the prairies, the great unoccupied commons of nature. The most careful estimates show that the annual increase in the demand for butter and cheese for our increasing population, from a growing foreign market, is ten per cent per annum; and this demand must be met by better cows, higher skill and more generous culture upon the old fields. There is one thing worthy of attention: In Europe a cow is kept well through the year upon an acre of land which is by nature in no respect better than yours; yet you take three or four acres. Time will change this, and we believe those are now living, who will, on a farm of 100 acres, keep 100 cows here. Feed the soil with a fair per centage of what you take from it, and you will be astonished by the luxuriance of your harvests. Do not imagine that I am going to try to instruct you in the art of making butter and cheese. I do not know from what region a man could come who would have a right to assume to know as much as a Chenango farmer. The value of a region in this age is its capacity to produce some article of commerce that the world will have and pay for. It was the plan of the Creator not to concentrate but to diffuse the necessities and luxuries of life over the continents and islands of the seas. This is to stimulate human energy to create mutual dependence and the necessity of social intercourse, and is in time to build up a homogeneous civilization. The snowy sails of commerce are to be the messengers of light and peace. Improved means of communication are bringing the extremes of the earth together. Nature has no production, art has created nothing, that you cannot command with the avails of your dairies. You are not isolated beings, living upon the resources of a neighborhood, but citizens of the world, sharers in all of its luxuries and glories.

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There is another consideration I would urge upon you, no matter what may be your pursuits. You were made to toil; you were also made to enjoy the fruits of your toil, and the beauty and glory of life. You are sharers, in common, of the ample provision the Creator has made for the happiness of all the children of men. For you beauty smiles from the sky, the earth yields a variety of fruit, of vegetation, of flowers that no man can enumerate or classify, each capable of improvement, and of being indefinitely multiplied. The grain of wheat committed to the earth sends up its stalk, bearing its hundred golden

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kernels; in every apple seed is the germ of the tree to give its life-bearing fruit to generations; in the acorn you tread under foot is the germ of the majestic oak, to make ribs for the mighty ships that traverse the seas. To divide your labor, to gratify your taste, animal life is swarming upon the earth, in the air and the waters. The atmosphere is made a medium for melody as well as life. Oils roll beneath your feet in rivers, and stones and minerals for your use, make the everlasting hills. No mind can comprehend the grandeur, the resources of the world; yet over it all, over every form of life, man is given dominion. All your mental faculties, all your senses are so many means for your enjoyment and your power; your enjoyment will be as just as they are cultivated. Man's physicial wants create necessities, and nature furnishes the means, not only of gratifying wants, but of cultivating reason, taste and affection. In matter man writes his thoughts, his tastes, his aspirations; as much in the garden, and field, and tree he cultivates, as upon the printed page or the canvas, or in enduring marble. Do not talk of the inequalities of condition. There is but little of the glory of the world that wealth can monopolize. It may rear a palace, it may paint its walls with fadeless colors, it may fill it with statuary, and the creations of art in every form and forbid you to enter. But need you repine? You inhabit a temple not made with hands. No mortal was by when the Almighty laid its foundations, and established its bounds. Will you find on painted walls anything like the heavens, illuminated with light, or glittering with stars? Will you find anything in statuary like the beauty of man or woman? Wealth cannot veil the sky or the mountain, or hush the song of the river as it rolls on to the sea. Is there any palace within whose walls there is such a scene as when the whole earth in spring puts on its green robes, when the hills, and the valleys and the trees are clothed with flowers and vegetation, until beneath the sere and yellow leaves of autumn, we see the ripened fruits and the means of life, while the earth puts on her robes of snow? This is the shifting and varied panorama we all behold each year of life, that has 6,000 times greeted the vision of mortals. This is what we were promised forever when the bow was set upon the clouds. Remember that life is a feast; that we are told in the inspired volume that "Whom God hath given riches, he hath given power to eat thereof, and take his portion and rejoice in his labor." Now, each day, is your opportunity to be happy; and if lost in the circle of the ages, it will never come back. No generation is made to toil and hoard up, and deny itself the feast of life, that another may have a superfluity. God has

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made in the earth and elements an ample provision for each generation by its performing its annual toil. But most of the fruits of the earth are perishable, so that there shall be no accumulated stores, no escape from the primal curse. If you would teach your children to be useful and happy, set them the example of being happy yourselves, by unsealing your own eyes by intelligence, by tasting freely of all the innocent pleasures of life. Cultivate in your own lives and hearts the hopes, the aspirations you would see bloom into a fuller and fresher life in them. Then, aside from all physical wants and provisions, you are social beings. For you all are the sacred ties of kindred, the treasures of all knowledge man has garnered up by 6,000 years experience and toil upon the earth. You have a part in the social life of the world and in the hope of immortality.

To present my idea more clearly, I will give you a picture of two families. I have seen families where the greed of wealth was the only passion; where the round of joyless toil followed day after day, and year after year, dwarfing body and soul; where lands and gold accumulated, but brought no luxury, no comfort, no pleasure to the home, where there was no smile on the face of childhood, no hope in its heart; where even life's spring was sunless; where children learned life only as it was taught them by parental precept and example. I have heard children complaining that the old man and old woman so long interposed their profitless lives between them and their inheritance, and I have seen the gray hairs of such parents go down in sorrow to a grave, unmoistened by a tear, unmarked by any monument. I have seen other families where industry has been intelligently directed, and its fruits enjoyed; where you could see the evidence of prosperity in the comforts of a home, around which the domestic virtues and affections clustered. There I have heard the voice of gladness. There I have seen children developing for usefulness and happiness. I have seen them strewing flowers on the sunset side of the Hill of Life, as their parents passed gently down to the shining shore. I have seen men, women and children weep around such parents' graves, and the first flowers of spring and the last of autumn, planted by tender hands, bloom above them.

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There is a tendency in boys to leave the farm for the whirl and excitement of the city, and for the uncertainties of professional and commercial life. This can only be counteracted by making home pleasant to them, by so educating them that work on the farm shall not be mere drudgery, but an intelligent use of the resources of

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nature. Nowhere as upon the farm do intelligence and taste so nearly wield creative power, and so readily ripen the conceptions of the mind into utility and beauty. Go to the cities, and where you can point out one who went to them as a country boy, and one who has achieved wealth and fame, I will find you ten besotted beings, going through the last stages of degradation ere they find a resting place in the potter's field. Yet they went with high hopes and a mother's blessing from pleasant country homes, and have failed and fallen. I say to parents, reflect before you send your children abroad. I say to the young, with happy homes in the country, who can become the owners of broad acres, who can have all the natural pleasures which belong to life, you are like our first parents in Eden. Partake of what God has given. Do not hazard all to taste the fruit of some forbidden or fabled truth, which fancy paints somewhere in the distance. If a boy has that in him which will give him success in the city, it will do it in the country, for the country has always been the nurse of greatness.

> "Who so wisely wills and acts may dwell
> As king and law-giver in broad-acred state,
> With beauty, art, taste, culture, books, to make
> His hours of leisure richer than a life
> Of fourscore to the barons of old time.
> Our yeoman should be equal to his home;
> Sit in the fair, green valleys, purple walled,
> A man to match his mountains, not to creep,
> Dwarfed and abused, below them."

Citizens of Chenango, you have a goodly inheritance. Your lines are cast in pleasant places. While honest toil has, within the present century, subdued the wilderness, and made fertile fields, beautiful villages, and happy homes, all the inventions and improvements of this marvelous age have come to your aid. The whistle of the engine, hastening from the north, will soon be answered by those coming from the south, the east and the west. A long-cherished hope is realized, and you are now upon one of the great highways of commerce. There are aged men here who have heard in this valley the shrill whoop of the savage, the voice that represented the past, and who have been spared to hear the voice of the engine, which represents civilization and the glory and promise of the future. Men will change, generations come and go, but still that voice will be heard in this valley, by day and by night forever. Amid your prosperity, do not forget your duties as citizens and men, for you are kings and law-makers. By precept and example sustain morality, for that is the

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foundation of social order, of individual happiness and of national greatness. Above all things cherish and sustain your schools, for in them the web and woof of national destiny are being woven. Remember that it is not of as much importance what races of horses, or cattle, or sheep, shall roam in your fields, as what kind of men and women shall take your places. Develop intelligence in your children; give all the sunshine you can to the spring of life; lay broad and deep the foundations of manhood and womanhood, and there will be light in the home, skill in the shop, and fruitfulness upon the farm. I have loved this valley since it was my early home. I have heard with pleasure of your material prosperity; but when I have read of the heroism of your sons in the terrible ordeal of battle, I have felt a higher joy. Their memory hallows your hills and valleys, and will forever. I want to see this county occupied by men who prize it not alone for the flocks and herds it can sustain, but for its beauty, for its history, because generations of noble dead sleep beneath the soil and await the resurrection. If you shall do your duty as well as the generations who laid the foundations of your prosperity; if the currents of social life shall be kept pure, then with all the accumulating resources for happiness, life in the future shall have a fullness, a beauty and a glory of which we can only dream.

CLINTON.

The Clinton County Agricultural Society has just passed another prosperous year, one which will long be remembered by its members, and which has given positive proof that the farmers of this county are making rapid strides toward the perfection of their calling.

This is truly gratifying to the leading members of the society. Feeling, as they do, a deep interest in the agricultural welfare of the county, and knowing that we rank very low when compared with other counties of the State, they have worked with a will and a determination to stimulate to greater efforts, all interested in cultivating the soil.

Large premiums have been offered, grounds have been rented at high prices, old buildings repaired and new ones erected, and everything placed in as perfect order as the limited funds of the society would permit.

At the last annual fair held on the 28th, 29th and 30th of September, 1869, the working officers and members received their reward.

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Such an exhibition was never known before in the county. Nearly every department was filled to overflowing, and with animals or articles well worthy a place at our State fair.

The competition was so strong in some instances that it was difficult for the judges to make decisions; and yet, with this close competition, only two or three out of about 200 exhibitors were dissatisfied, and they, like all others who complain, had no just reasons for so doing. The weather during the three days was clear and beautiful; the attendance much larger than could reasonably have been expected, and everything seemed to pass off to the entire satisfaction of all, excepting the ones above mentioned.

But what this society most needs now is grounds and buildings. Our last fair showed plainly the non-suitableness of those we now occupy. The grounds are too small, and the buildings a disgrace to any society. We hope ere another season arrives for our annual exhibition, to own grounds and buildings, such as will be a credit to any county society. The annual meeting for the election of officers was held on the 28th ult., and resulted in the choice of Sylvester B. Miller, Plattsburgh, for president; Robert Bailey, Plattsburgh, secretary; Darius W. Marsh, Beekmantown, treasurer.

The treasurer's report shows the following:

Unexpended balance, including State appropriation, 1868,		$332 80
Receipts at fair 1869		1,616 90
		$1,949 70
Paid premiums	$667 50	
Other expenses	1,006 77	
		1,674 27
Cash on hand		$275 43

The weather has been unusually cold, but no frosts until October. Hay and grass an abundant crop. Corn, poor quality, from ten to forty bushels per acre; average about twenty bushels. Wheat, prime quality, from eight to fifty bushels per acre; only a few small fields of the last; average about eighteen bushels. Oats, fair quality, from twenty to seventy-five bushels per acre; average thirty-five bushels. Norways are just starting. Barley, average thirty-five bush Potatoes, a good crop, but some varieties rotting badly; from fifty t 300 bushels per acre, harvested; the "potato fever" is fast gaining ground. Fruit: Trees that did not bear last season bore, as a gener thing, this, and those that bore one year ago did not this seaso

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Stock breeders are changing from sheep to cows, for the purpose of manufacturing cheese. A number of factories are being erected in the county.

S. B. MILLER,
Secretary.

COLUMBIA.

The twenty-ninth annual fair of Columbia County Agricultural Society was held at Chatham Four Corners, September 14th, 15th, 16th and 17th. The weather was fine throughout, and there was more stock exhibited than has been for years. Some excellent sheep and swine were exhibited. The show of horses probably was never surpassed at any fair in the county. In the way of fruit, vegetables, and other farm products, the display was excellent. The cultivation of the grape has been successfully engaged in by some of our horticulturists, and several fine varieties were exhibited. Agricultural and domestic implements were well represented, there being a large number of entries. Floral Hall and the ladies' department was one of the most attractive places on the grounds, and was constantly thronged with a large concourse of people. The ladies of our county take a great interest in the welfare and success of our fair and society, and their assistance is of great service to us. Below find account of receipts and expenditures.

Amount received as gate fees		$3,043 51
received as booth and ground rent		471 61
received as State appropriation		324 19
		$3,839 31
Amount of repairs and other expenses	$1,766 17	
of premiums paid	1,998 50	
		3,764 67
In treasury		$74 64

The officers of the society elected for 1870 are: President, George L. Morris, Chatham Four Corners; secretary, H. Milton Ford, Chatham Four Corners; treasurer, Henry D. Simpson, Chatham Four Corners.

H. MILTON FORD,
Secretary.

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CORTLAND.

The Cortland County Agricultural Society held its thirty-first annual fair on the 21st, 22d and 23d of September. The display of cattle, sheep, swine, etc., was satisfactory to the society and to the large gathering of farmers of our county and vicinity. Of fruits and vegetables, mechanical and agricultural implements, the show was not as large as usual, but was pronounced very good.

Floral Hall and the ladies' department, of needle-work, fine arts, etc., were creditable, and, financially, the fair was a success.

At the annual meeting held in January, the following officers were elected for the year 1870, viz.: President, Alonzo D. Blodgett, Cortland; secretary, Jas. C. Carmichael, Cortland; treasurer, Morgan L. Webb, Cortland.

J. C. CARMICHAEL,
Secretary.

TREASURER'S ACCOUNT.

To balance account of 1868		$1,197 02
amount received June horse exhibition		948 05
amount received at annual fair		1,010 70
		$3,155 77
Amount paid premiums and expenses of June exhibition		$504 25
Amount paid insurance on buildings		60 00
paid premiums and expenses at annual fair, viz.:		
for premiums awarded	$792 75	1,002 33
for expenses paid	209 58	
Balance in treasury to new account		1,589 19
		$3,155 77

DELAWARE.

The Delaware County Agricultural Society held its twenty-ninth annual fair at Walton, the 14th, 15th and 16th days of September, 1869. The weather was all that could be wished, and the attendance was very large. There was a fine display in nearly all the classes. This is the third year in succession the fair has been held in Walton, and is the fifth time it was held there.

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The people of that vicinity take an active interest in the fair, especially the ladies, who are always first in every good work, and their hall spoke well for their skill and industry. The officers of the society feel greatly encouraged, and feel the efforts they put forth to make the fair a success are appreciated. The winter meeting of the society for the election of officers and awarding premiums on dressed meats, field crops, etc., was held in the court-house at Delhi, January 5th, 1870. There was the usual interest manifested, and a fair show of dressed meats, fruits and grains. Five spring pigs attracted much attention. Robert McMurray, of Delhi, exhibited three pigs, ten months' old, which weighed, dressed, respectively, 446, 354 and 332 pounds. S. H. White, of Delhi, exhibited two, nine months' old, which weighed 371 and 338 pounds each.

The following is the report of the treasurer for 1869:

Balance on hand last report	$388 38
Received at winter meeting	10 00
membership at the fair	484 00
from sale of tickets	445 15
rent	57 00
State appropriation	258 38
Total	$1,642 91

DISBURSEMENTS.

Paid premiums awarded January 6	$75 00
expenses and premiums of 1868	37 50
for taking statistics	111 00
expenses of fair, 1869	350 58
premiums of fair, 1869	663 75
Balance on hand	405 08
Total	$1,642 91

The following are the officers for 1870: President J. B. Yendes, Delhi; treasurer, G. W. Hanford, Deposit; secretary, Porter Frisbee, Delhi.

PORTER FRISBEE,
Secretary.

DUTCHESS.

In submitting a brief report of the transactions of this society, it is gratifying to be able to state that its condition is highly prosperous. It was one among the first county societies organized in the State, and

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from its first exhibition to the last it has not lacked that generous support needed to make such an institution successful; and it is believed that success in getting up large and showy exhibitions is not all that can be said of it, but that it may be safely added as among the results of its efforts. Thus far some real benefit has been reaped. It has been the object of its managers to guard, as far as possible, against its being controlled by any one interest; but that every department should receive its fair share of encouragement. At our fairs the door has been opened wide for all, and invitations extended to all to make their contributions to whatever department their interests, tastes or convenience might with propriety incline them. Ample conveniences have been provided upon our show grounds for the products of the farm, the garden, the household and the workshop. Long lines of stables for horses, with suitable drives for showing them, a supply of stalls for cattle, pens for sheep and swine, large halls for the protection and display of fruits, vegetables, implements and the various articles of domestic manufactures, both useful and ornamental, all provided with much labor and at heavy cost; and yet it is a frequent remark at our exhibitions, as it probably is at those of other societies, "that this or that department is not what it ought to be; that the society is doing too much for this and too little for that." It would be highly gratifying to the officers of every agricultural society to see all the various departments and classes fully represented; but it is a thing not easily accomplished. They can provide the necessary accommodations for an exhibition, can offer suitable prizes to be competed for; but here their efforts in a great measure must end. Its success must depend upon those who can and will contribute to it. That the tastes or the interests of any should induce them to leave the field of practically useful competition and direct their attention to things of a light, trivial or exciting nature, is greatly to be regretted. That the fault does exist in our own society, as well as in others, let us frankly admit, and look to its cause and the means of overcoming it. The difficulty, expense and danger of moving some articles and animals to the fair grounds is in many instances no small matter. There is, perhaps, more complaint that the cattle department is deficient than any other, and yet the causes of the deficiency are not always considered. The well-fed horse can step to the fair grounds with ease, while the great fat ox can only be moved with difficulty, to say nothing of the danger of injury to himself and of loss to his owner. There are other obstacles to an extensive competition in this department. There are really but few fine herds of cattle in any one com-

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munity, and their owners are very careful how they come in competition with each other. The owner of one herd keeps himself well posted as to the character and excellence of his neighbor's, and unless he sees a fair prospect of bearing off the prizes, very prudently keeps his own at home when fair day comes. The same may be said of other classes of stock; but in none does this practice work such injury to an exhibition as in the cattle department. The season may also have much to do with a full exhibition. Cattle depend principally upon the summer pastures for their condition, and these pastures may fail; while the horse, drawing his rations from the grain box, can be always ready to show himself. But supposing every department to be equally well filled, it cannot be questioned but that there is still an inclination on the part of many to leave the things of mere practical utility with a single glance and give the attention to things of more showy, amusing or exciting character. A single visit to the cattle stalls, the sheep pens, the collection of farm implements, the fruit tables, the show of fancy work, satisfies the visitor, while the shifting scenes upon the drive make a field of continued and exciting interest. It is believed that our society, while aiming to give all classes of exhibitors an equal chance, is doing its duty to avoid, as far as practicable, the injurious tendency alluded to. No large prizes are offered on any class of horses, or any prizes whatever for speed alone. If it still be said that too much attention is given to this department, we can only say, let there be a united effort to fill up other departments, thereby increasing their attractiveness, and so overbalance what may seem objectionable, with a display of such things as shall produce an influence only for good. The fair for the year was held at the society's grounds, Washington Hollow, on the 14th, 15th, 16th and 17th days of September, and in almost all respects may be spoken of as eminently successful. Weather good, attendance large, the exhibition in most classes full and excellent as to quality. In the stock department, the horse, as usual, was predominant in numbers and attractiveness; many noted stallions were on exhibition.

The society's gold medal, of the value of $100, for the best trotting stallion, kept in this or any adjoining county, was won by "Burger," kept in Pleasant Valley, in this county. The prize of fifty dollars and the society diploma, for the best stallion for all purposes, kept in this or any adjoining county, and at least six colts of his get, from one to five years old, was won by "Superb" and colts. The show in this class was truly fine. No contest of speed was required, but

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the winning group and those with whom they competed, were shown as the owners thought best, and together made a display that challenged the admiration of all that saw them. The cattle stalls were not as well filled as could have been wished. The season had been unusually dry, and cattle did not generally look well, and as a consequence the exhibition fell short in this department; still there were many fine animals shown. Mr. George Ayrault had about forty head, principally of natives, grades, working, and fat, all in good condition. W. & J. Griffin, filled up the short horn stalls with a fine lot of animals, and bore away most of the prizes in the class. They also had a pair of fat oxen of great size, superior quality, and very fat; it is doubtful whether a better pair were ever shown at any fair of the society. In the class of Alderneys, Mr. A. A. Underhill had the field entirely to himself, showing a number of superior animals. The sheep-pens were passably well filled, but many of the animals would not bear high praise, the season telling badly against them. In poultry, a new and extensive interest appears to have sprung up; the entries were numerous, and many fine birds of various distinct breeds were shown. It is supposed, that hereafter this branch of the exhibition will be much better. While noticing the points in which the show seemed deficient, it is gratifying to refer to those in which it excelled. The display of farm implements, which all must admit to be an important part of such an exhibition, was very good indeed. Although these implements were most of them drawn twelve miles over a common road, the entries were very numerous, and the articles of the most improved patterns. A large assortment of carriages, beautiful in design, thoroughly constructed, and highly finished, attracted the attention of many visitors. Of the display of vegetables, grain, fruit, domestic manufactures, machinery, needle-work, paintings, flowers, and the many miscellaneous articles with which the two large halls were filled, it is unnecessary to say more, than that it was all that could have been reasonably asked for, and was entirely satisfactory to the many visitors present.

On the afternoon of the last day, Tristram Coffin, Esq., delivered a brief, practical, and instructive address. He urged, that the experienced farmer should take upon himself the duty of teacher, and not depend upon professional men for addresses, and upon the rising generation to adhere to their calling, striving to dignify and honor it.

Officers elected for the year 1870: President, John W. Storm, Lagrangeville; treasurer, Thomas W. Jaycox, Wappinger's Falls; secretary, George Sweet, Washington Hollow.

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The financial condition of the society is as follows:

Balance on hand at date last report		$17 44
Gross receipts fair, 1869		5,970 29
Total receipts from all other sources		412 19
		$6,399 92
Total expenditures year 1869		5,918 01
Balance on hand		$481 91

GEORGE SWEET,
Secretary.

ERIE.

The transactions of the Erie County Agricultural Society for the year 1869 are more favorable, in a pecuniary point of view, than were its transactions of 1868. The society held its annual fair on the same grounds as last year, "The Hamburgh Driving Park Association," commencing on the 15th day of September, and continuing for three days. The display of sheep, horses, cattle and swine was much better than the previous year, and a much greater interest appeared to be manifested by farmers than any year since I have been acquainted with the affairs of the society. The weather continued beautiful during the fair. In this section of the State the season was particularly backward, caused by the cold, rainy spring, so that the show of fruit was very poor indeed. Grapes had not yet ripened, nor even turned their color. Peaches, apples and pears, except a few early varieties, were too backward and uninviting to make anything of a display, although a great variety were on exhibition.

The annual address was delivered by Hon. James Sheldon, of Buffalo, and was well received by a large and respectable gathering of farmers. It contained many useful and practical suggestions and presented the calling of farmers in a new and honorable light, and would well repay a careful perusal by any who might be interested in behalf of farm labor.

The attendance during the fair was the largest since the organization of the society, and a general interest and good feeling was manifested by all present.

The society has very much improved its permanent buildings, and has made many additions, in the way of building a secretary's office, a new ladies' hall, and other smaller buildings.

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The receipts from the fair were about double the receipts of last year, amounting to nearly $1,000, and we congratulate ourselves on our favorable condition and prospect of the early payment of our indebtedness, which has been gradually increasing since 1860.

The annual meeting of the society, held on the 12th day of January, was well attended, and the president, secretary and treasurer of 1869 were re-elected for another year.

Receipts.

Balance last annual report		$129 82
Received for tickets		784 95
Received of Comptroller		453 39
Miscellaneous		145 25
		$1,513 41

Disbursements.

Paid premiums	$580 90	
other expenses	570 90	
		1,151 80
		$361 61

R. C. TITUS,
Secretary.

ESSEX.

The twentieth annual fair of the Essex County Agricultural Society, was held on their fair grounds at Westport, September 28th, 29th and 30th. The number of entries made of stock, and articles for exhibition, was less than last year; yet in several departments the display was superior in quality, and very creditable to the farmers of Essex county. The weather was fine, and attendance larger than any previous year; financially, it was a complete success. Our society is now out of debt and in a prosperous condition. The annual meeting was held February 9th, and the following officers were elected for the year 1870: Jonathan Mather, of Essex, president; B. B. Richards, of Westport, secretary; Edwin B. Low, of Westport, treasurer.

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Receipts for 1869, all sources		$1,369 31
Payments.		
Current expenses	$398 50	
Debt incurred for building and fencing new grounds	440 08	
Premiums and purses	486 93	
Balance on hand	43 80	
		1,369 31

B. B. RICHARDS,
Secretary.

FRANKLIN.

The eighteenth annual fair was held on the society's grounds at Malone, September 21st, 22d, 23d and 24th, 1869. It was continued one day longer than usual in consequence of unfavorable weather the first day. The general exhibition was good; attendance large, and receipts far in advance of any previous year. Our farmers are taking considerable pride in raising stock, which has shown a decided improvement in the past few years in our county, the show of thoroughbred cattle being much better than at any previous exhibition.

The following is a statement of the financial condition of the society, January 1st, 1870:

Amount on hand from last year	$240 28
received from State	121 87
received from fair	3,801 76
received from other sources	62 30
	$4,226 21

DISBURSEMENTS.

For building, grading grounds, and expenses of fair	$2,042 92
Amount paid for premiums	876 00
in hands of treasurer	1,307 29
	$4,226 21

The annual meeting of the society was held January 13th, 1870, and the following officers were elected for the ensuing year: President, Clinton Stevens, Malone; secretary, S. S. Willard, Malone; treasurer, M. S. Mallon, Malone.

S. S. WILLARD,
Secretary.

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FULTON.

Our county fair was held on the 28th and 29th days of September, 1869. The first day was windy and cold, and our exhibition was not much better than last year. The display of stock was very good considering the day. There was quite a display of cattle, sheep, fruit and fancy articles. The following officers were elected for the ensuing year: Jacob Boshart, president; J. J. Davidson, secretary; N. P. Wells, treasurer.

J. J. DAVIDSON,
Secretary.

GENESEE.

The society has, during the year 1869, held two fairs, both of which were decided successes.

The following is a condensed statement of the condition of our treasury, viz.:

RECEIPTS, 1869.

Balance cash in treasury from 1868	$179 29
Received from State	224 25
Receipts of two fairs	2,679 31
from all other sources	410 50
	$3,493 35

EXPENDITURES, 1869.

Cash paid permanent improvements, 1869	$983 00
premiums at fairs	1,556 00
all expenses of the year	751 95
	$3,290 95
Cash on hand	202 40
	$3,493 35

No debt of any kind exists against the society. At the annual meeting held this day, the following officers were elected for 1870, viz.: Isaac A. Todd, Byron, president; A. N. Cowdin, treasurer; L. R. Bailey, secretary.

O. R. CLARK,
Secretary.

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GREENE.

The annual fair of the Greene County Agricultural Society was held in Cairo, on the 30th day of September and the 1st day of October, 1869. The ground occupied by our society for the past ten years for holding our fair and cattle show, being under cultivation, we made many efforts to secure a permanent location, but without success.

We finally rented an open field, on which there is a good half-mile track, erected temporary buildings for the exhibition of domestic manufactures, flowers, fruits, paintings, etc., and appealed to the public to sustain us, to which they most generously responded.

We had fine weather, and the attendance was larger than at any former gathering of the society. Notwithstanding the privilege of entering the field from almost every point, our receipts from the sale of tickets was larger than the most sanguine dared to expect.

The entries were not so numerous as we sometimes have, but the quality was far superior. The show of working cattle and steers has never been equaled in this county. The unanimous report of the judges on all classes of cattle was, "The best we have ever seen at our fairs."

In sheep there was a falling off, but in swine an advance of former years. We had a less number of "fast" horses, but a good exhibition of carriage and farm horses.

The show of fruit, grain and vegetables was a decided improvement on the past. The department of domestic manufactures, flowers, paintings, mechanical implements, etc., was highly creditable to the exhibitors, and elicited much praise from the public.

Considering the discouraging circumstances, our fair may well be called a success, judging from the general interest and satisfaction of the crowd, as well as the favorable state of our finances, being able to pay our debt of the last year, the expenses and premiums of this, with a small surplus on hand. An able and instructive address was delivered by Prof. Silas Fitch, but no copy was furnished for publication.

We held our annual meeting on the 11th December. The interest, which has seemed to be on a decline, revived, and the feeling that it is time "we should do something" seemed to pervade our meeting.

We predict a brighter future for our society. We also made arrangements to secure a favorable location for our fair for the next ten years, the erection of the necessary buildings, etc. Appearances

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indicate that, in our next report, we shall be able to report progress.

Officers for the present year: President, Hon. Joshua Fiero, Catskill; secretary, George W. Russ, Acra; treasurer, H. B. Kirtland, Durham.

TREASURER'S REPORT.

Received for members' tickets	$116 00
for entrance at gates	404 68
for rent of stands	15 00
for donation	32 00
	$567 68
Amount of premiums paid and to be paid	$414 00
Other expenditures	240 99
	$654 99

GEO. W. RUSS,
Secretary.

HERKIMER.

At the date of the last report there was remaining in the treasury a balance of		$696 36
As properly chargeable against this balance there has been paid for expenses and salaries of 1868 unpaid by former treasurer	$195 19	
For premiums awarded in 1868 and paid in 1869	159 50	
		354 69
Leaving the actual balance		$341 67
The receipts for rents, carryalls, etc., during 1869 was	$532 41	
From sale of tickets and entries	2,664 47	
From State	273 00	
		3,469 88
		$3,811 55
The disbursements for 1869 have been:		
For premiums	$1,409 25	
For expenses and salaries	1,718 94	
		3,128 19
Balance in treasury December 31, 1869		$683 36

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The twenty-seventh annual fair of the society was held on the society's grounds, near Herkimer, on September 15th, 16th and 17th, and notwithstanding the fact that the State fair at Elmira drew away a great number of persons, as did also the county fair in the adjoining county of Otsego, the attendance on the fair grounds of this society was much larger than in any previous year.

The first day was occupied almost exclusively in receiving entries of articles for exhibition, and this was continued until noon of the second day. The whole amount of premiums offered in the different classes was $2,015; amount awarded, $1,511.25. The number of entries in the department of horses was 100, and the display was excellent. It was to be regretted, however, that the entry of farm teams and working horses was not as large as in former years. Many of our enterprising dairy farmers seem to be turning their attention, so far as horses are concerned, to a display of speed, rather than strength and hardiness for the rougher work of the farm. In the cattle department the entries were forty-six, and the display of Ayrshires and Alderneys was very superior. H. Burch, Esq., of Little Falls, exhibited "Lord of the Isles," a two year old bull from the herd of Walcott & Campbell, which attracted general and deserved notice. The exhibition of dairy products was mortifying to the members of the society; but one or two entries of cheese and butter being made, and these of a quality far inferior to the general production to be found in the markets of the county. The Executive Committee intend next year to recommend an increase of premiums in this department, in hopes to bring out an exhibition worthy of the county which gives its name to every box of cheese which reaches the European market. In the fruit, vegetable and mechanical department the display was good, especially in the latter. The total number of entries in all the departments was 748, besides which discretionary premiums were awarded for a large number of unspecified articles.

On the second day of the fair over 10,000 people were upon the ground. The annual address was delivered by the Hon. Horatio Seymour. This address was well received by the farmers present. A terrible storm of wind and rain set in about noon of the third day, but the programme of proceedings arranged by the board of managers was thoroughly carried out, and the fair was pronounced by all a perfect success.

This being emphatically a dairy county, the weekly range of the cheese markets give a fair idea of the prosperity of the farming community, which can easily be thus reached. The cultivation of

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the cereals is, of course, almost the exception on all farms; but one or two improvements in the agricultural status of the county may be noticed:

1st. In the determination evinced, and being carried out by many of our best farmers, to hereafter cultivate sufficient grain for home consumption.

2d. The successful result of experiment in raising for the dairy, cows produced upon the soil, from the farmer's own herd, in preference to the former system of selling as "barrellers," all broken down and effete stock, and replenishing the dairy with cattle purchased from drovers at the railroad centers, which have been procured from the refuse of western herds and brought east for a market.

3d. There is daily growing up in the county an increased love for agricultural pursuits, with a desire to use the best and most successful adjuncts of farm labor, which bids fair to make the valley of the Mohawk, and the hill country north and south the garden of the State. The best and most improved agricultural implements are manufactured in the county, and the home demand is extensive, indeed, no improvement of value can be introduced which Herkimer county farmers will not adopt, when once its usefulness is approved; and as time in its course shall, as it will, bring to us from our own, and from sister States, the products of American ingenuity, which are to lessen the labors of the plowman, the milker, the sower, the reaper, and all the sons of honest toil, no section will sooner grasp the new idea and give of its wealth to push on the car of agricultural progress than this beautiful county, which is honored over all the world by the name of the great patriot, whose life blood mingled with the waters of the Oriskany and the Mohawk as they rolled onward to the sea, and whose grave is within its borders unnoticed and unvisited.

H. CLAY HALL,
Secretary.

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JEFFERSON.

Balance in hand at last annual report		$2,330 02
Memberships at annual meeting	$75 00	
State appropriation	446 06	
Memberships before the fair	15 00	
Sale of tickets	2,561 06	
Rent for victualing and fruit	77 50	
Cash, $1.20; pasturing grounds, $50	51 20	
		3,225 82
		$5,555 84

Disbursements.

For building barn and stalls	$1,371 00
Other expenses, including premiums	2,097 13
Cash on hand	2,087 71
	$5,555 84

W. IVES,
Treasurer.

LEWIS.

Receipts.

Cash on hand	$609 77
received State appropriation	129 19
received sale member tickets	1,065 00
received sale single tickets	191 00
	$1,994 96

Disbursements.

Premiums	$666 00	
Printing	63 00	
Rent of fair ground	150 00	
Amount paid for police during the fair	75 00	
		954 00
Balance in the hands of treasurer		$1,040 96

Officers for 1870: Daniel Whitaker, Martinsburgh, president; F. B. Morse, Lowville, secretary; C. G. Riggs, Turin, treasurer.

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LEYDEN CHEESE FACTORY ASSOCIATION.

Statement and proceeds of James Van Name, of Collinsville dairy, for the year 1869, of milk delivered at factory of H. C. Markham.

Number of cows	24
pounds milk delivered	97,920
pounds milk delivered per cow	4,080
pounds cheese per cow made	426
Proceeds from sales per cow	$70.35

The cows were fed, from the 1st of March to the 27th of April, two and a half bushels of carrots per cow; from April 27th to August 20th, 100 pounds shorts per cow, the shorts mixed with whey; from August 20th, on green corn stalks.

Report of H. C. Markham, Collinsville, Lewis county cheese factory, for the year 1869:

Commenced making cheese April 27th, 1869; ended October 30th, 1869.

	Pounds of milk delivered.	Pounds of cheese.	Pounds of milk for 1 lb. cheese.
May	147,796	15,624	9.45
June	224,281	24,759	9.05
July	213,556	23,206	9.33
August	179,314	20,181	8.88
September	155,930	17,267	9.08
October	104,125	12,935	8.05

Average number pounds of milk for one pound of green cheese, 9.

Average number pounds of milk for one pound of cured cheese, $9\frac{57}{100}$.

Value of one pound of milk during season, $1\frac{73}{100}$ cts.

Green cheese made during the season, 113,967 pounds.

Cured cheese made during the season, 107,057 pounds.

Average sales per hundred pounds, $16.48\frac{3}{4}$.

Total amount of sales, $17,651.85.

Number of cows, 300.

Number of patrons, 18.

LIVINGSTON.

At the annual meeting of the society, held on Tuesday, January 5th, 1869, the following officers were elected for the then current year: Aaron Barbor, of Avon, President; Kidder M. Scott, of Geneseo, Treasurer, and William A. Brodie, of Geneseo, Secretary.

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The financial condition of the society will appear from the report of the treasurer, and for which this society has reason for congratulation, in view of the very large premiums which were offered, and the unusual amount of premiums awarded at the annual fair held on the 29th and 30th days of September last.

The premium list as published previous to the fair, was the largest ever offered by this society, amounting to upward of $1,500, and the amount of awards was $1,198.

Never was the society in a more prosperous condition than at present, and the last annual fair was the best held by the society for years. The exhibition of both thorough-bred and grade cattle was unusually large and excellent, and in farming implements the largest exhibition for many years was made.

Harmony has thus far prevailed in the councils of the society, and with the same spirit in the future, the society cannot fail of being prosperous, and advancing the agricultural interests of the county.

TREASURER'S STATEMENT, DECEMBER 31, 1869.

On hand		$1,362 07
Receipts, 1869		1,576 65
		$2,938 72
Disbursements.		
Premiums, 1869, as paid	$1,163 50	
Other expenses	832 49	
		1,995 99
On hand		$942 73
Excess of expenditures over receipts		$419 34

W. A. BRODIE,
Secretary.

GENESEO, *January 1st*, 1870.

MONROE.

On the 5th day of July, under the auspices of the society, a horse fair was held upon their grounds, the receipts whereof to the treasury of the society, were	$1,029 10
The contributions to the society at their annual exhibition on the 22d, 23d and 24th days of September, 1869, were,	1,670 35
Received State appropriation	472 87
Received for rent of grounds during the summer	133 50
Total receipts	$3,305 82

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EXPENDITURES.

Horse Fair.

Clerks, police, common labor and preparation of the grounds	$277 35	
Printing	183 60	
Postage	6 29	
Premiums paid	665 00	
		$1,132 24

Annual Exhibition.

Clerks, police, common labor	$392 25	
Printing	317 20	
Insurance	32 50	
Postage, stationery, ticket boxes, livery, furniture and temporary repairs	151 91	
Hay and straw	93 55	
Premiums	1,821 25	
		2,758 66
Total expenditures		$3,940 90

M. D. ROWLEY,
Secretary.

MONTGOMERY.

The receipts of the society for the year, were $1,655. The premiums awarded being much larger than any previous year, and owing to the extra expenses attending the adjournment, there will not be as large an amount to apply on the mortgage debt of the society as was hoped. There was a manifest lack of interest by the ladies in making floral hall attractive. The list in that department should be revised. It has been suggested that a meeting of ladies be called for that purpose, to assemble in August next, and we hope such an arrangement will be made, and that a list will then be made that will insure a full and tasty show in the hall the coming fair. The show in the stock and mechanical departments far exceeded any previous exhibition, and it is regretted by the society that committees on awards should desire to divide the honors of premiums rather than award the same on merit alone. This course tends to injure the society and greatly displeases exhibitors. The selection of awarding

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committees is made by the directors at their August meeting, at which meeting there is usually barely a quorum. Some towns being unrepresented entirely. This delinquency of directors embarrasses the directors present, and the consequence is improper committees are made; committees who do not attend, and who are chosen for a particular duty that they are entirely unacquainted with, and incompetent to perform. It should be the duty of every person elected as officer or director on receiving notice of his election, to accept, or decline the honor that another, who would attend to the duties of the position, could be chosen. This would insure a full meeting; the different interests of the several towns would be alike cared for, proper lists would be made, and the arrangements of the society's exhibitions would be far better and more satisfactory to the people.

The society has applied to the commissioners of agriculture for seeds and grain for distribution at the April meeting of the officers and directors, when it is hoped there will be a full attendance.

The following officers and directors were elected at the annual meeting: President, Col. Simeon Sammons, Fonda; Secretary, A. H. Burtch, Fonda; Treasurer, T. R. Horton, Fultonville.

A. H. BURTCH,
Secretary.

NIAGARA.

Our society has held two fairs the past season; both very creditable; the fall exhibition being the most successful in point of receipts ever held in the county. By a rearrangement of our ticket system the society is able to show a much better balance sheet than usual; the receipts being several hundred dollars in excess of former years. The difference is mainly attributed to frauds that have been practiced upon the society heretofore.

During the past season we have erected a large and commodious hall upon our grounds sufficiently ample in its accomodations for all exhibitors, at an expense of $2,821.06, upon which there has been paid $1,650.

The officers for the ensuing year are: Isaac H. Babcock, President; George N. Nichols, Secretary; E. Simmons, Treasurer; P. O. address of all the above is Lockport.

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FINANCES.

Cash on hand 1869	$870 57
Received from State in January	226 69
Interest on bonds and premium	127 20
For use of society's grounds	25 00
Life membership	10 00
Sale of tickets	1,762 33
Received November 16 from State	226 69
	$3,238 48
Disbursements	2,910 65
Balance in hand of treasurer	$327 83

CROPS FOR 1869.

The wheat crop was twenty-five per cent in excess of any ever raised in the county before. Barley very heavy; probably never better. Oats the same. Corn below an average about fifteen per cent. But very little clover seed. Timothy seed an average crop. Heavy yield of hay, but badly damaged by rains. Potatoes rotted badly, many not worth digging; particularly peachblows.

FRUIT.

Apples in great abundance; much above an average; sales reported December 1st, about 220,000 barrels. Peaches below the average. Pears above the average. Quinces small in size, but in excess of former years. Grapes badly injured by early frosts; particularly late varieties.

The season has been one of great abundance, and all kinds of vegetation have made rank growth, though about two weeks later than usual. The weather has been remarkably cool and heavy rains prevailed from June until December. Farm work in consequence was poorly done; and weeds, thistles, etc., made rapid headway. The cold weather found much corn in the field, and husking has been protracted into January of 1870.

GEO. N. NICHOLS,
Secretary.

ONEIDA.

The twenty-ninth annual fair of the Oneida County Agricultural Society, was held on the grounds (at Rome) which the society have occupied for several years past, September 27th, 28th, 29th and 30th, 1869. The weather during the four days mentioned, in strong con-

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trast with that which had prevailed in this county for much of the current season, especially for the three months just previous, was highly propitious; and the fair, consequently, proved, to the delight of the well-wishers of the society, a success in all particulars.

The grounds occupied by the society have been much improved during the past year, especially by the erection thereon of sundry buildings, universally conceded to be a necessity and very marked improvement, and by repairs and additions to those already built. The chief expenditure of money in the direction of these needful improvements, has been upon a new hall for the ladies' department of the fair, furnishing an appropriate place for the deposit and exhibition of the great variety of articles contributed by the thrifty and skillful wives and daughters of Oneida; a place where all such articles may be freed from the hazards and uncertainties of the weather, and be at the same time more satisfactorily displayed, to the credit of their exhibitors.

But the improvement manifested this year, was not alone that incidental to the increased accommodations of the ground and buildings for the display of handiwork, the proper securing of stock, etc., although this was so thoroughly creditable. A greater improvement in point of enthusiasm and interested purpose, was clearly shown in the personal efforts of many residents of the county, resulting in a display of stock of every name, agricultural and other mechanical appliances, manufactures, ladies' handiwork, both of the useful and the ornamental types; fruit in great variety, and vegetables, of which any resident or native of the old county might well be proud.

In some of the classes of the stock department, it is true, that the display of animals was not as great numerically, as it was hoped that it might be; but in no class was there an unworthy specimen on exhibition. All competition for the prizes offered by the society, was between examples in each class that would be deemed worthy of notice and consideration anywhere.

Of horses, there was an exhibition truly commendable. A good number being shown in every class except stallions; and in that class, quality and beauty offered no inconsiderable compensation for numeri cal deficiencies.

Of horned cattle, the display was excellent, whether considered in point of numbers or quality; the various classes being well filled and competition exceedingly close in almost all of them. By lovers of farm stock this department was claimed to be the best filled of all known to the society's authorities.

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Of sheep, the entries were few as compared with those of the classes just mentioned, yet it may fairly be concluded that these occupied as large a place in the fair, as in the resources of husbandry of our farmers, proportionally.

Of swine, the show was, without doubt, disproportionately small, and observers could not help wondering where the "heavy weights" of our winter newspapers were to be reported as coming from.

Of poultry, there was, considering the time of the year, a fine display, both as regards variety and quality of those samples exhibited; but this was mainly from the stock of a few individuals. With many of the fowls it was the moulting season, so that they could hardly be expected to display that life and beauty which would mark them at some other seasons.

In the dairy department there was a surprising and almost unaccountable lack of *cheese*, considering the number of cheese factories and home dairies which the county boasts, leaving the casual observer to suppose that the foreign demand must be such as to keep the stock in hand at any one time particularly light. But of butter there was an abundant supply, so universally excellent in quality as to afford no small trouble to the judges in that class.

In the line of horticultural products there was a great variety upon exhibition, and yet not that gratifying fullness of display which the farmers of our county might surely afford by the exercise of but a trifle more of consideration and forethought. It is to be remarked, however, that the peculiarities of the current year in point of weather in this region may have affected the display seriously. Many kinds of fruit being fully two weeks later with us this year than last, and at least ten days later than they would be any average year. Of vegetables it was to be remarked that no monstrosities were presented for exhibition, while a good display was made of the varieties ordinarily raised in the gardens or upon the farms in this latitude. Certainly those of our farmers who have been in doubt regarding the expediency or profit of root crops, or regarding the uncertainties of their culture, might take fresh courage from the display made in horticultural hall.

In the matter of mechanical appliances and manufactures, a great variety of articles found room, including as it would seem, a wonderful diversity of purpose in the employment of industry among our inhabitants. Farm tools and machinery for doing everything that wood and iron can do in place of muscle, were on exhibition not only under the shelter of roofs in places specially appropriated to

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them, but were scattered here and there over the grounds in proximity to the buildings, and called out no little questioning as to purposes and uses from the throngs of visitors; self-elected committees discussed their points, and doubtless arrived at sage conclusions thereon, whose wisdom will not find embodiment in the society's report.

From the fact that there were many miscellaneous entries of various machines, musical instruments, etc., from without our county limits, it is fair to infer that Oneida county furnishes a promising market for worthy inventions and manufactures that is appreciated and desired by tradesmen elsewhere.

The annual address was delived on Thursday, September 30th, by Rev. James Deane, of Westmoreland, the theme being "the failures and successes of farm life."

Statistical information regarding the yield of the various crops and produce in the county, for the year 1869 has not appeared in sufficient fullness to admit of any really "well considered" statement thereupon.

It may be said however, that the agriculturists of the county have been on the whole most agreeably disappointed, both as respects quantity and quality of the crops secured. Probably not quite the usual breadth of land was given to wheat; the yield, however, is good, and quality excellent. Oats were better than an average crop. Corn, the failure of which was confidently predicted by croakers, was by far better than the sanguine had anticipated, say at August 1st, and though not a *great* yield, was very fair. Of potatoes there was certainly no dearth, though in some localities the early varieties were affected by disease. Fruit was uneven; small fruits doing well in almost all localities. Pears, in general, a good crop, but apples in many sections scarce and poor, while others enjoyed more than an average crop.

Much attention is paid to the manufacture of cheese in Oneida county, and much capital invested in the necessary stock and fixtures. Improvements in the processes of manufacture are noted and, if really of practical worth, adopted. It is thought that the produce in this line from our county will bear comparison with that of other portions of the State.

The annual meeting was held at Clinton, January 9th. The attendance was unusually large, but the display of fruits, grain and roots not as varied as in some previous years. The following officers for the ensuing year were chosen: President, John L. Dean, West-

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moreland; Treasurer, James Elwell, Rome; Secretary, Roderick Morrison, Clinton.

Receipts with balance from previous years.....	$3,840 00
Disbursements.....	2,866 00
Leaving a balance in treasurer's hands of.....	$974 00

RODERICK MORRISON,
Secretary.

ONTARIO.

The annual fall exhibition of the society was held on the society's grounds in the village of Canandaigua, on the 21st, 22d and 23d days of September, 1869. The weather was fine and the attendance large. The entries in the various departments did not differ materially from that of other years.

The exhibition of cattle was not what it should have been, either in respect to numbers or quality.

The exhibition of horses was not up to former exhibitions, although there was a large number of entries made in that department; there were however a few fine horses on the ground. The exhibition of sheep was good, not so large in numbers as we have had in former exhibitions, but the quality was very good.

On the whole the fall exhibition of 1869 was not up to the exhibitions of the society in former years, although the receipts were fully an average.

The amount of money remaining in the treasury as appeared by the annual report of the treasurer:

January 1869, was.....		$375 54
Amount received from voluntary contributions to date ..		1,502 01
		$1,877 55
Paid premiums.....	$921 10	
" other expenses.....	657,95	
Total paid out.....		1,579 05
Leaving balance on hand January 26th, 1870.....		$298 50

The annual winter meeting for the election of officers for the ensuing year, and awarding premiums on seeds and field crops, was held January 26th, 1870.

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But one entry was made for premiums on field crops, the statement of which is hereto annexed.

Thirty-nine entries were made in the seed department.

The following persons were elected officers for the ensuing year: Harvey Paddleford, Canandaigua, President; John S. Coe, Canandaigua, Corresponding Secretary; A. S. Newman, Canandaigua, Treasurer.

WALTER MARKS,
Corresponding Secretary.

January 26th, 1870.

Statement in reference to field crops for which a premium was awarded by the Ontario County Agricultural Society, January 26th, 1870:

POTATO CROP.—L. WILCOX, CANANDAIGUA.

I hereby certify that I raised from one acre and 152 rods of ground, 601 bushels of peachblow potatoes, being at the rate of 308¼ bushels per acre.

The land is a black loam; planted in corn the previous year and well manured for corn, no manure was used for the potatoes.

The land was plowed deep, and the potatoes planted from the first to the sixth of May, in drills three feet apart, and one seed in a place, about twelve inches apart; the drills were opened and the seed covered with the plow. Thirty-five bushels of seed were used in planting the field. Seed cut so as to leave from one to three eyes on a piece. The land was reasonably free from weeds and kept by the cultivator clean during the season. The crop was harvested from the fifteenth to the twentieth of October, nearly all were sold for shipment, the purchasers' measurement being taken in determining the quantity. The manner of saving the crop was as follows: A heavy plow drawn by two horses was used to loosen the ground and throw out the tubers, followed by men with potato hooks, raking over the ground so that only a few were lost.

Value of the crop and expenses of raising the same.

Cr.

By 550 bushels sold at 40c	$220 00
51 bushels small and planting at 25c	12 75
Carried forward	$232 75

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Brought forward		$232 75

Dr.

For thirty-five bushels of seed at 4s	$17 50	
plowing and preparing ground	10 00	
planting	6 00	
cultivating and hoeing	8 00	
digging and hauling to railroad	25 00	
		66 50
Profit		$166 25

L. WILCOX,

CANANDAIGUA, *Dec. 7th*, 1869.

ORANGE.

Officers for 1870: Ellis A. Post, President; David A. Morrison, Secretary, Goshen; Jason W. Corwin, Treasurer, Goshen.

TREASURER'S REPORT.

Receipts		$1,888 00
Disbursements:		
Premiums	$786 00	
Expenses	863 12	
Balance on hand	238 88	
		1,888 00

GEO. W. MILLSPAUGH,
Late Secretary.

ORLEANS.

The thirteenth annual fair of the Orleans county agricultural society was held at Albion, on the 17th and 18th of September, 1869.

The weather though at first quite threatening, finally proved very favorable.

The exhibition in nearly all classes was very fine, and the great number and variety of articles showed plainly that the interest of our citizens in the well being of the society continued unabated. The whole was a great success, financially, as well as in other respects, the receipts being larger than for several years past. The society may be said to be in a flourishing condition, and every effort will be

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put forth by the officers and board of managers, to make the ensuing exhibition our very best. The subject of erecting new buildings is under consideration, which it is to be hoped may result in some decided action as we are sadly in need of them.

The crops of the county have, as a general thing, been quite good. The apple crop was excellent, and proved a source of great revenue to our farmers, who rely upon it when all others fail. For a few years past nurseries have been extensively planted, and are beginning to yield a rich return for the labor bestowed upon them. They have suffered more or less from the ravages of mice during the past winter, not sufficiently however to affect the general crop.

I append a list of the officers of the society for 1870: James Bailey, President; C. A. King, Secretary; Cyrus Farwell, Treasurer.

The receipts during the current year, exclusive of the State appropriation, are	$1,628 37
Add surplus on hand January 1, 1869	41 46
	$1,669 83

The disbursements are as follows:

Premiums	$674 00
Current expenses	831 65
Balance in the treasury	164 18
	$1,669 83

CHAS. A. KING,
Secretary.

OSWEGO.

Although the two days preceding our fair were of such a character as to fill all hearts with the most gloomy forebodings as to its satisfactory completion, the elements finally favored us, and the two last days were all that could be desired, both as regards attendance and weather. Never before in the history of the society has there been so successful an exhibition under its auspices.

Tuesday was mostly occupied in making entries, classifying stock, arranging and adorning the spacious hall with the numberless articles there displayed, fruit, flowers, specimens of cookery, sewing machines, musical instruments, samples of photography, and fancy articles almost *ad infinitum*.

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During the morning it was dark and lowery—the sun being entirely hidden—with occasional showers, and quite cold. In the afternoon, although the sky was frequently overcast, and some rain fell, it gave better promise of a wished-for breaking away and warmer weather; the sun, in setting, coming out clear and bright.

On the second day the morning dawned clear and sunny.

As regards live stock our fair, we regret to state, is never what it should be, our farmers not seeming to have as much pride in raising fine blooded cattle, as those of some other counties. Still the display of native stock was large and embraced some very fine specimens. The only bull other than native was of the Alderney, or Jersey, breed. Several yoke of oxen were exhibited, none of which were inferior; one pair of workers that were very large and in good condition, weight 4,000 pounds.

In respect to cows, the display was quite extensive, and some appeared to be very fine milkers.

Quite a number of heifers were entered for premiums.

The display of swine was quite large, and none were inferior. We noticed nothing in the line especially deserving of notice, unless it were one or two pens of large, fat porkers. Of sheep, eight or ten bucks were shown, mostly of the middle and coarse wool varieties. One merino was noticeable, however, the heavy folds on his neck lying thick and deep; also a large South Down. A considerable number were exhibited, some large pens being nearly filled with white fine-looking lambs and sheep.

A fine lot of the several kinds of poultry was entered.

At no previous anniversary has there been a larger and better variety of fruit than on this occasion.

A magnificent display of canned fruit was made, thirty-one kinds. Also the largest assortment of flowers. Some rare plants were entered, and some beautiful bouquets.

The display in the agricultural hall was considered superior to any of former years.

The vegetables were arranged for exhibition in this hall, and the enormous size to which some of the beets, carrots and cabbages attained was truly astonishing. Some radishes were much admired on account of their extra proportions. All the various kinds of grains were here to be seen, and the exhibit in this line was a very creditable one.

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Receipts.

Balance on hand	$52 25
From members, 1869	1,359 00
At gates, 1869	762 73
For fines, etc	3 00
For rents	312 75
From the State	319 31
	$2,809 04

Disbursements.

Premiums	$688 00
Printing and advertising	234 84
Expense statistics	45 00
Incidental expenses, postage, etc	41 22
Loans, etc., paid	646 00
Labor and materials	240 60
Balloon ascension	250 00
Balance on hand	663 38
	$2,809 04

H. L. DAVIS,
Secretary.

OTSEGO.

The fifteenth annual fair of the Otsego County Agricultural Society was held at Cooperstown on the 14th, 15th and 16th of September, 1869.

The first day was devoted to making entries; the second day to the examination of the articles on exhibition by the several committees; the third to trying the speed of trotting horses and to the report of committees. There were a large number of entries made. The receipts were about the same as last year. More attention is being paid to the manufacture of butter and cheese; more fine specimens of which were on exhibition.

The show of horses, cattle and working oxen gave evidence of improvement in the various breeds.

Many of our farmers are giving more attention to sheep, the show of which was fair.

The present grounds of the society—fourteen acres, one-half of which are leased—have been sold, and new grounds, embracing about

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twenty-seven acres, have been purchased, lying near the corporation limits of Cooperstown; and we expect to be two years in getting them in good condition, with proper buildings, for the use of the society.

The hop crop was about half an average yield of the past ten years, say 350 pounds to the acre. A large proportion of the yards not well cultivated, which will account for the small yield.

Oats. Heaviest yield in many years in this county, and harvested in fine order.

Hay as large as we have had in many years.

Barley about the same as oats.

Corn. This crop was less than an average, owing to our backward spring.

Wheat. The crop of last year was not large.

Buckwheat. Very little sown and yield light.

Potatoes about an average crop; very little rot.

Our farmers are paying more attention to fruit; young apple and pear trees, especially, are being put out in great numbers.

TREASURER'S REPORT.

Disbursements:

Expenses	$1,047 81
Premiums	1,224 20
Statistics	72 00
On hand	700 00
	$3,564 69
Receipts	3,564 69

Officers 1870: President, Henry Roseboom, Cherry Valley; Secretary, Horace M. Hooker, Cooperstown; Treasurer, Charles F. Hendryx, Cooperstown.

HORACE M. HOOKER,
Secretary.

PUTNAM.

The annual fair of the Putnam County Agricultural Society was held on the fair grounds, on September 22d, 23d and 24th. The stock and articles exhibited were about the same in quality and variety as of the last five or six years.

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The following is a detail of the receipts and expenditures for the last year, and annexed is a list of the premiums awarded, to whom, and for what purpose:

Receipts.

Receipts for life membership, at $10 each	$350 00
Receipts at the fair	1,905 75
From State Treasurer for 1869	92 62
	$2,348 37

Expenses.

Paid on a judgment against the society	$500 00	
Paid premiums	540 00	
Premiums uncalled for	146 50	
Cost of gold medal premium	65 00	
Rent of grounds	100 00	
Improvements on buildings and grounds	140 46	
Police and clerks	228 90	
Printers' and decorators' bills, etc,	293 31	
		2,009 17
		$339 20

GEORGE W. GREGORY,
Secretary.

QUEENS.

The laws of the State of New York require that each county agricultural society participating in the appropriation for the encouragement of agriculture, shall annually report its transactions to the State Agricultural Society. This time-honored custom has been complied with by "Old Queens" for the past twenty-eight years. The limited space, however, allotted by the State Society in its published report, compels us to reduce matters to a comparative small area.

This year, a number of members, believing that our official position as secretary and treasurer for the past *twenty years*, has enabled us to collate and preserve documents, which at the present day would be otherwise impossible to procure, have solicited us to prepare them in a condensed form, and incorporate such labors in our annual report, for future reference. We cheerfully comply with their request, with a view of rescuing from oblivion, such records, papers and extracts, as may illustrate the past history of the Queens County Agricultural Society, and submit them for your acceptance.

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There is good evidence that the first fairs held in the county, originated about the latter end of the seventeenth century, from the practice held at the sheep-partings, when the various flocks kept on the great Hempstead Plains were, in the month of October or November of each year, driven to some large central pen, and the claimants, proving property by some ear-mark, drove them to their own enclosures; while those remaining without a claimant were sold at auction to the highest bidder. This sheep-parting, attracting large bodies of men from distant parts of the county, and other places, was considered the great holiday of the year. In alluding to this custom, the author of Historical Sketches says: "Creditors came in quest of debtors; dealers and traders of all sorts made bargains; horses were swapped, and scrub-races, etc., were the order of the day."

The first horse show was appointed by Governor Nichols, in 1668, "not so much," says he, "for the divertisement of youth, as for encouraging the bettering of the breed of horses, which, through great neglect, has been impaired."

The first record of any fair being held in the county is May 6, 1728. The advertisement reads: "The Jamaica Fair opens to-morrow, and continues four days, when there will be exposed for sale a variety of goods, merchandise, and several fine horses. It is expected the 'Lion' will be there to be seen."

A society was organized in New York city in 1763, combining among its members the most talented and distinguished men in the colony. In their circular, dated December 10, 1764, they commence by stating: "This society is formed, consisting of persons of all ranks, who propose to advance husbandry, promote manufactures, and suppress luxury. Several hundred pounds are already subscribed." This association was very useful in its day, and was intimately connected with the prosperity of Long Island.

December 21, 1767, the New York Agricultural Society awarded £10 sterling to Thomas Youngs, of Oyster Bay, for a nursery of 27,133 apple trees.

In 1774, by an act of the Assembly, two fairs for Queens county were to be held at Jamaica, on the first Tuesday in May, and the third in October, each to last four days.

From 1811 to 1815, the county judges met annually at the court-house, to award premiums for the best woolen cloths made in the county.

The first meeting toward forming a properly organized agricultural society, was held at the court-house, November 11th, 1817.

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Lewis S. Hewlett was appointed chairman, and John I. Cornwell, secretary. The only thing accomplished was appointing a committee to make arrangements for a general meeting in December following; but not finding sufficient encouragement, the matter was passed over.

On June 2d, 1819, a meeting was held at the court-house, Daniel Kissam acting as secretary. Then it was voted to form an agricultural society, and adjourned to meet June 21st, when Rufus King, of Jamaica, was chosen president, and the following other officers: *Vice-Presidents*, William Jones, Effingham Lawrence, Singleton Mitchell; *Corresponding Secretary*, David S. Bogert; *Recording Secretary*, Thomas Phillips; *Treasurer*, Daniel Kissam

MANAGERS.

North Hempstead.—John I. Schenck, Benjamin Treadwell, Benjamin Platt, Joseph Dodge, Jr.

Jamaica.—Nicholas Wyckoff, Timothy Nostrand, Lawrence Roe.

Oyster Bay.—Lewis Hewlett, Townsend Cock, John B. Coles, Jr., Nelson Lloyd.

Newtown.—Col. Edward Leverich, Col. George Gibbs, Timothy Roach, Rev. Evan M. Johnson.

Hempstead.—Rev. Seth Hart, Jacob S. Jackson, Thomas Tredwell, Oliver Hewlett.

Flushing.—Abraham Cock, Thomas Powell, Richard Cornell, James Lawrence.

The first fair was held at the court-house, November 2d, 1819, when $200 was awarded in premiums.

The second fair took place at the court-house, November 2d, 1820, The Long Island *Star* says: "There were more people assembled than was ever before witnessed in the county on any occasion." A premium was awarded to Townsend Cock for the celebrated horse "Duroc," and to the Hon. Rufus King, for the best milch cow.

The third fair was held November 7, 1821.

The last fair of this society was held October 24th, 1822, when an address was delivered by Effingham Lawrence, Vice-President. Premiums were awarded for cotton raised in the county, to Colonel Leverich, Newtown; Dr. Rogers, Jericho; and Daniel C. Coles, Oyster Bay.

For several years the New York County Agricultural Society encouraged agriculture and manufactures by awarding premiums to members residing in Queens county. Among them we find a silver cream pitcher to Mrs. Cornelius R. Remsen, of Newtown, for the

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best butter; $30 to Gen. N. Coles, Dosoris, for the best brood mare; E. Leverich, Newtown, $10 for best litter of pigs; John Treadwell, Hempstead, $10 for best oxen; John H. and W. R. Jones, Cold Springs, $10 for best cassimere, $10 for best woolen blankets, and $10 for best flannel; also, a dozen silver spoons to Mrs. Thomas Lawrence, and the same to Mrs. William Bragaw, of Newtown, for superior butter.

The present Queens County Agricultural Society originated at a meeting of the executive committee of the New York State Agricultural Society, held at Niblo's, New York city, on the 21st of July, 1841, when, upon motion, a committee consisting of the following persons was appointed to solicit donations and new members to the society, and to make arrangements for the organization of an agricultural society for Queens county:

Newtown.—Grant Thorburn, Garret Cowenhoven.
Flushing.—John W. Lawrence, Effingham Lawrence.
North Hempstead.—Singleton Mitchell, Robert W. Mott.
Oyster Bay.—John Wells, Albert G. Carll.
Hempstead.—John Bedell, Edward H. Seaman.
Jamaica.—William R. Gracie, John Johnson.

On the 2d of October, 1841, a meeting was held at the court house. Hon. Singleton Mitchell was called to the chair, and Albert G. Carll appointed secretary, when it was unanimously

Resolved, That it is expedient to form an agricultural society in this county, and that a committee of one person from each town be appointed to report a constitution.

The chair appointed Robert W. Mott, North Hempstead; John G. Lamberson, Hempstead; Effingham Lawrence, Flushing; Thomas B. Jackson, Newtown; John Johnson, Jamaica; Albert G. Carll, Oyster Bay.

On the 9th of October, 1841, the society was organized, and the following officers elected:

President, Effingham Lawrence; *Vice-Presidents*, George Nostrand, Wm. Henry Carter, Thomas B. Jackson, Platt Willets, Singleton Mitchell, George D. Coles; *Corresponding Secretary*, Albert G. Carll; *Recording Secretary*, John G. Lamberson; *Treasurer*, Daniel K. Youngs.

The first circular was issued March 21, 1842, containing the following appeal to the citizens of the county: "We ask you to unite with the society and give it your encouragement; and not let it be said

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that the farmers of Queens county have not sufficient spirit to keep an agricultural society in existence."

Arrangements were made to hold the first fair on Tuesday, October 13, 1842, at the hotel of Robert G. Anderson, in the village of Hempstead; and the Hon. Wm. T. McCoun, Vice-Chancellor of the State, was invited to deliver the address.

A procession, consisting of the Hempstead band, clergy, orator, officers and members of the society, and citizens generally, was formed and marched from the hotel to the Methodist Episcopal church. The exercises commenced by the choirs of the village churches singing an ode by William Cullen Bryant, as follows:

Far back in the ages,
The plow with wreaths was crown'd;
The hands of kings and sages,
Entwin'd the chaplet round,
Till men of spoil disdained the toil,
By which the world was nourished.
And dews of blood enriched the soil,
Where green their laurels flourished:
Now the world her fault repairs,
The guilt that stains her story;
And weeps her crimes amid the cares
That formed her earliest glory.

The proud throne shall crumble,
The diadem shall wane,
The tribes of earth shall humble
The pride of those who reign:
And war shall lay her pomp away—
The fame that heroes cherish:
The glory earned in deadly fray,
Shall fade, decay and perish.
Honor waits o'er all the earth,
Through endless generations,
The art that calls her harvest forth,
And feeds the expectant nations.

The church was well filled, and the address received great approbation. The following extract is interesting: "The timely and successful formation of this society I consider a fit subject of congratulation among you. Under proper management it cannot fail to be an instrument of much practical good to the county; and all classes of her citizens have reason to rejoice in the prospect, not only of immediate benefit to result from it, but of future and *permanent* usefulness."

The gross receipts for the year amounted to $338, including ninety-one dollars from the State. About $250 were awarded in premiums. The exhibition gave general satisfaction.

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The second fair was held at Hempstead, October 17th, 1843. The following ode, by the same author mentioned above, was sung in the tent erected in the hotel yard:

How happy is the husbandman!
More happy than a king!
For, after all, a diadem
Is an uneasy thing;
And the hero with his laurels
All fresh upon his brow,
Is not so light of heart as he
Who whistles at the plough.

Then God be with our pleasant land,
And give us men of worth,
To cultivate and understand
The treasures of the earth:
And blessings on our native soil;
Forever may it be
The heritage of plenteousness,
For hands unstained and free.

The receipts of the year were $368.85, of which ninety-one dollars were from the State.

The third fair was held at Jamaica, October 10th, 1844. Hon. Gabriel Furman delivered the address, which was highly extolled as being "rich in historical, scientific and agricultural facts." The receipts were, in gross, $410.12, including ninety-one dollars from the State.

The fourth fair was held at Hempstead, October 9th, 1845. The show of cattle was unusually small, in consequence of a very rainy day. The receipts, including ninety-one dollars from the State, amounted to only $200.81.

The fifth fair, held at Flushing, October 9, 1846, was made more interesting by the American Institute holding a plowing and spading match at the same time. A band of music was furnished from Governor's Island. The performers and delegation were conveyed through the village in a wagon drawn by thirty-six yoke of oxen, the wagon tastefully decorated. The exhibition tent was profusely decorated with flowers and evergreens from the Flushing nurseries, and is spoken of as a rare and beautiful sight. The receipts were $349.20.

The net receipts for 1847 and 1848, exclusive of the State money, amounted to only $175 for the two years. The society was under a cloud—the officers discouraged; and a meeting was held to determine what course should be adopted toward paying the premiums in arrears.

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The fair of 1849, at Flushing, somewhat improved the finances of the society, but many premiums remained unpaid, and a subscription was taken up to obtain means to pay them. It was evident that the affairs of the society had arrived at a crisis. The secretary, Mr. A. G. Carll, was discouraged and resigned his office. The president did all he could to encourage the officers left, and entreated them to use increased exertions.

The number of recorded members were as follows:

Oyster Bay	38
Hempstead	32
Flushing	32
Jamaica	16
North Hempstead	10
Newtown	10
Kings county and New York	11

The receipts for 1849 were $445.27.

The present secretary and treasurer was elected in 1850. President John A. King was a tower of strength; with him we went from house to house, and found a generous response. Jamaica returned sixty-seven members, and the other towns a large increase. We therefore took courage. It was, however, hard to get entries for the ensuing fair. A tent only fifty feet in diameter contained all the articles exhibited, except a solitary plow from Ruggles, Nourse & Mason, of Boston. The cattle were in a field near by, and the horses were shown on the turnpike. The receipts of the year amounted to $591.66.

The fairs continued to be held alternately in Hempstead, Jamaica and Flushing.

The receipts of the first ten years amounted to $4,101.59; for the second ten years, $19,096.11. During the succeeding four years the fairs were held on grounds fenced in, with increased and superior facilities for the display of stock and other articles. These arrangements were appreciated by exhibitors, and the gross receipts for the four years amounted to $20,071.51.

The society had hitherto existed without any form of incorporation. The greatly increased list of members, its improving finances, the zeal of its officers, and the position it occupied among its sister societies in the State, were by its friends deemed good and solid reasons that we should be legally authorized, when the proper time came, to hold real estate and personal property without taxation, in pursuance of chapter 183, Laws of 1856; and at the annual meeting held November 30th,

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1857, a plan of organization was submitted by the secretary, and adopted, as follows:

CERTIFICATE.

Certificate of incorporation of the Queens County Agricultural Society, under and pursuant to an act of the Legislature, entitled "An act to facilitate the forming of agricultural and horticultural societies," passed April 13th, 1855.

We, John Harold, John Bedell, Joseph Tompkins, William T. McCoun, B. W. Doughty, Samuel T. Jackson, Uriah Mitchell, James P. Smith, Samuel L. Hewlett and Jeremiah Valentine, citizens of the United States, and of the State of New York, hereby associate ourselves together for the purpose of forming a society for improvement in agriculture, horticulture, and the mechanic arts, as hereinafter stated, and to be incorporated under and pursuant to the act entitled "An act to facilitate the forming of agricultural and horticultural societies," passed April 13th, 1855; and for that purpose we do certify and declare:

First. That the corporate name and title of such society shall be the "Queens County Agricultural Society."

Second. The business and objects of the said society are, improvement in and encouragement of agriculture, horticulture, and the mechanic arts.

Third. The property and business of the said society shall be managed by six directors, as prescribed by said act, which six directors, together with the president, vice-president, secretary and treasurer of the said society, shall constitute a board of managers; and Robert Willets, Joseph Tompkins, Robert T. Smart, Samuel M. Titus, R. Eugene Thorne and Daniel R. Suydam shall, in conjunction with the president, vice-president, secretary and treasurer of the said society, conduct the business thereof for the first year.

In witness whereof, we have hereunto set our hands and affixed our seals, the 30th day of November, 1857.

JOHN HAROLD, Hempstead.
JOHN BEDELL, "
JOSEPH TOMPKINS, Newtown.
W. T. McCOUN, Oyster Bay.
SAMUEL T. JACKSON, Oyster Bay.
B. W. DOUGHTY, Jamaica.
JEREMIAH VALENTINE, Flushing.
URIAH MITCHELL, "
SAMUEL L. HEWLETT, North Hempstead
JAMES P. SMITH, " "

Queens County, L. I.:

On the 30th day of November, 1857, before me, came John Harold, John Bedell, Joseph Tompkins, W. T. McCoun, B. W. Doughty, Samuel T. Jackson, Uriah Mitchell, James P. Smith, Samuel L. Hewlett, Jeremiah Valentine, known to me to be the individuals

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described in, and who executed the foregoing certificate, who acknowledged that they executed the same.

AUGUSTUS G. SILLIMAN,
Justice of the Peace.

State of New York, } ss:
Secretary's Office, }

I have compared the preceding with the original articles of association of the Queens County Agricultural Society, this day filed in this office, and do certify that it is a correct transcript therefrom and of the whole of such original.

Given under my hand and the official seal, at the city of Albany, this 3d day of December, 1857.

N. P. STANTON,
Deputy Secretary of State.

On the 1st of July, 1858, an interesting trial of mowing machines took place near Mineola, on the farm of Valentine Willis. Eight machines entered. A great number of visitors were present.

At the annual meeting held November 26th, 1859, the first action was taken toward permanently locating the fair grounds, by passing the following resolution:

Resolved, That a committee from each town be appointed by the chair to solicit from the town of Hempstead the appropriation of 100 acres of the plains, for permanent buildings and grounds for the use of this society, to report at a meeting of the society to be called for that purpose.

The chair appointed the following committee: A. J. Spooner and Oliver S. Denton, Hempstead; Hon. John A. King, Jamaica; Hon. Wm. T. McCoun, Oyster Bay; R. E. Thorne, North Hempstead; Robert Willets, Flushing; Thomas B. Jackson, Newtown.

A report not having been received from the committee appointed on permanently locating the fair grounds, at the annual meeting held November 26th, 1860, the following resolutions were adopted:

Resolved, That the society is desirous of a permanent location for its annual exhibitions, near Hempstead Branch, now Mineola.

Resolved, That a committee of three be appointed to confer with the authorities of the town of Hempstead, for fifty acres of plain lands, for a permanent location.

Resolved, That R. E. Thorne be appointed on that committee, with power to select two associates from the town of Hempstead.

The following notice was published in the *Queens County Sentinel*, March 21st, 1861:

"Notice is hereby given, that an application will be made at the ensuing town meeting, to the people of Hempstead, for a grant of

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fifty acres of land, for a permanent location of the Queens County Agricultural Society.

"R. E. THORNE,
JOHN W. DEMOTT,
JAMES M. SEAMAN,
Committee.

"DATED, *March 21st*, 1861."

The town meeting was held on Tuesday, April 2d, 1861, and the following resolution passed:

Resolved, That fifty acres of the common Plain land belonging to the town of Hempstead, and lying between the village of Hempstead and the Hempstead Branch, be leased by the proper officers of said town to the Queens County Agricultural Society, for a nominal sum per year, as a permanent location for their fair ground; and that the supervisor and justices of the peace of said town, with the committee appointed by the said society, are hereby appointed a committee to lease the same.

The conditions of the lease to be that when the society cease to use the said fifty acres for agricultural fair grounds, it shall revert to the town.

The society, having declined to accept the lands as proposed in the preceding resolution, the same was repeated at the town meeting held in April, 1862.

At the annual meeting held November 28th, 1864, it was

Resolved, That this meeting of the society recommend that the subject of a permanent location be duly considered and brought before a special meeting of the society, at the court-house, on the second Wednesday of January (11th), 1865, at ten o'clock A. M.

At a meeting held January 11th, 1865, a resolution was adopted appointing a committee of three from each town to select a site for a permanent location.

At the Hempstead town meeting, held April 4th, 1865, a resolution was adopted renewing the offer of leasing fifty acres of Plain lands to the society.

At a meeting of the board of managers, held May 20th, 1865, the committee appointed January 11th reported in favor of a permanent location at Queens; and, after considerable discussion, it was

Resolved, That the town committees canvass their various towns and ascertain the views of members, by taking a vote of resident members of 1864, whether they are in favor or against a permanent location, but no recommendation shall be made by the board unless two-thirds of those voting are in favor of permanently locating the fairs of the society.

In the month of January, books were prepared and placed in the

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hands of the town committees, consisting of three persons in each town, with instructions to canvass their respective districts and take the votes of members. The committees had these books in their hands nearly nine months, and when they were made up it was found that nearly two-thirds were in favor of a permanent location, as follows:

	For.	Against.
North Hempstead	203	4
Hempstead	174	1
Oyster Bay	143	1
Jamaica	48	49
Flushing	27	121
Newtown	14	167
	609	343

Majority for, 266.

At the annual meeting held on the 5th of December, 1865, the following resolution was unanimously adopted:

Resolved, That in view of the large majority of the members in favor of a permanent location (numbering nearly two-thirds), that this meeting express their opinion that the time has now come to secure the proper grounds, and the board of managers are requested to secure the same, either at Queens, Mineola, or at some suitable point between them, as they may deem most expedient, before the next annual exhibition.

Offers of land were subsequently made from Queens and Hyde Park, but the price was deemed too high. An offer was also made by the town of Hempstead to lease fifty acres. These propositions were considered at a meeting of the board of managers, held on the 27th of February, 1866, and the following resolution was adopted:

Resolved, That the board permanently locate the exhibitions of the society on land in the town of Hempstead, near the village of Mineola, provided the town of Hempstead will deed —— acres on such terms as shall be deemed advantageous to the society.

At the annual town meeting of the town of Hempstead, held on the 3d day of April, 1866, the following resolution was passed by nearly a unanimous vote of the inhabitants:

Resolved, That the supervisor and town clerk of the town of Hempstead sell and convey by deed, for a nominal sum, to the president and board of managers and their successors in office, of the Queens County Agricultural Society, or a society of like import known by any other name, forty acres of Plain lands; such plot of forty acres to be located somewhere north of the present cemetery, on a north and south line with Washington street, in the village of

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Hempstead, provided the said land shall, by a covenant or condition in said deed contained, revert back to the town of Hempstead whenever said land ceases to be used for or by a society whose end and aim is to promote the interests of agriculture.

The board of managers accepted the proposal of the town of Hempstead on the 7th of April, and appointed the following committee to confer with the authorities of the town of Hempstead, in laying out the land and receiving the deed: S. T. Taber, president; John Harold, secretary and treasurer; S. M. Titus and S. B. Mersereau, directors. The thanks of the society were voted to the town of Hempstead for their liberality.

The same committee were empowered to lay out the grounds, receive plans and estimates for, and attend to the erection of the buildings suitable to the requirements of the society, such as fences, entrances, business office, exhibition buildings, dining hall, cattle and horse stalls, sheep and swine pens, and a suitable drive for the show of horses, not exceeding half a mile in circuit. The secretary was also instructed to prepare such plans and specifications as he deemed suitable to the wants of the society.

There was considerable delay experienced in procuring the deed from the town officers, the supervisor desiring the grounds to be located close to the cemetery, while the committee wished to have the location near the main line of the Long Island railroad, at Mineola.

The supervisor expressed a desire to consult with some persons in his town, before he could arrive at a decision. On the 12th of May a public meeting of the inhabitants of Hempstead was held, when the following resolution was unanimously adopted:

Resolved, That in the judgment of this meeting, the supervisor and town clerk of the town of Hempstead will consult the interest and wishes of the inhabitants of the said town by delivering to the officers of the Queens County Agricultural Society, a deed for the plot of land within the limits prescribed by the resolution passed at the last annual town meeting, to be located where, in the opinion of said society, it will be most favorable for the object intended.

The following memorial was then drawn up, and during a very few days received the signatures of nearly 500 residents of the town:

To the Supervisor and Town Clerk of the town of Hempstead:

The subscribers respectfully represent that they are inhabitants of the town of Hempstead; that in their opinion it was the intention of those voting in favor of the resolution passed at the last annual town meeting empowering the supervisor and town clerk to execute a deed for forty acres of Plain land, to the Queens County Agricultural Society, that the same should be located where the same was desired

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by the society, and that in our judgement a conveyance of a plot of land to be so located will meet with the concurrence and approval of the inhabitants of the town.

Dated Hempstead, *May* 12, 1866.

The supervisor having failed to respond to the resolutions passed by the citizens of the town of Hempstead on the 3d of April and 12th of May, and it being necessary to decide on the time and place for holding the fair of 1867, a meeting of the board of managers was held at Remsen's hotel, Jamaica, on May 9th, in pursuance of published notices, to receive offers for the location of the fair, either at Jamaica, Flushing, or Newtown. While this matter was under discussion, the supervisor of the town of Hempstead met the board and stated "that himself and town clerk would be ready to convey a deed for the land selected by the society, so soon as the same could be surveyed and the boundaries defined."

And on the 22d of May, the supervisor and town clerk, together with the officers of the society, met at Mineola, with the surveyor, Oliver S. Denton, Esq., and laid out forty acres of Plain lands, in pursuance of the resolution passed by the electors of the town of Hempstead, April 3d, 1866. The deed was received on the 26th of May, and recorded on the 28th of the same month.

The deed conveys "all that certain tract, piece or parcel of land, situate in the said town of Hempstead, and upon and being a part of the common lands thereof, known as the 'Plains,' bounded and described as follows, that is to say: Beginning at the north-easterly corner of the hereby granted premises, at a mere-stone, or boundary stone, distant about four rods southerly from the fence inclosing the land of Thomas Albertson (said boundary stone being upon a line with the westerly line of Washington street, in the village of Hempstead, and also with the easterly side of the public cemetery,) and running from said boundary stone south eighty-one degrees and forty-five minutes west, ten chains eight links to a stake; thence south, seven degrees east, thirty-seven chains and forty-one links to a stake; thence north eighty-two degrees east, eleven chains and thirty links to a stake standing on a line with the easterly side of the public cemetery; and thence north eight degrees and forty-five minutes west, on a line with the westerly line of Washington street aforesaid, thirty-seven chains and forty-one links to the place of beginning; containing within said bounds forty acres, according to a survey made by Oliver S. Denton, May 22, 1866. To have and to hold the above granted, bargained and described premises, with the appurtenances

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unto the said parties of the second part, and their successors in office to their own proper use, benefit and behoof, so long as the same shall be used by the said Queens County Agricultural Society for the promotion of the interest of agriculture; and this conveyance is upon the express condition that whenever the said above granted and described premises shall cease to be used for the purpose of promoting the interest of agriculture, the same shall revert and be surrendered to the said town of Hempstead and the inhabitants thereof, in its and their original estate and condition, with the full right, privilege and power of re-entering thereupon and resuming possession thereof as if the same had never been granted or conveyed.

"(Signed by) ROBERT CORNWELL, *Supervisor.*
SANDS POWELL, JR., *Town Clerk.*"

The vote of the inhabitants of the town of Hempstead was legalized by an act of the Legislature, chapter No. 613, Laws of 1867, as follows:

CHAPTER 613.

AN ACT in confirmation of the conveyance of lands to the Queens County Agricultural Society, and extending the powers of the officers of said society. Passed April 23, 1867.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. The action of the electors of the town of Hempstead, county of Queens and State of New York, and of the supervisor and town clerk of said town, in the conveying, by deed, to the president and board of managers, and their successors in office, of the Queens County Agricultural Society, forty acres of the Plain lands of said town, for a nominal consideration, in conformity with a resolution of the inhabitants of said town, passed at their annual town meeting, held duly therein, on the third day of April, eighteen hundred and sixty-six, is hereby legalized, ratified and confirmed, and the president and board of managers of said agricultural society, and their successors in office, are hereby authorized to hold, convey or lease said lands, or any part thereof, or any lands which said society may hereafter acquire, and also the buildings erected, and to be erected thereon, for any purpose not inconsistent with this act, or with the grant of said lands to said society, or of the laws of this State; and said board of managers of said Queens County Agricultural Society are hereby vested at all times and may exercise the same police authority over and around the grounds now in, or hereinafter to be in the possession and under the control of said society, and the adjacent space surrounding the same, as is now vested in such board of managers upon fair days, by the acts of March seventh, eighteen hundred and fifty-nine, and of April seventeenth, eighteen hundred and sixty-two.

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§ 2. Nothing in this act shall be construed to authorize or permit the said Queens County Agricultural Society to use or lease their grounds, or any portion of them, for purposes forbidden by, or inconsistent with the provisions of the general act in relation to the formation of agricultural societies, or other acts prohibiting horse racing.

§ 3. This act shall not be construed to authorize the use of the grounds of said Queens County Agricultural Society for trials of speed or racing of animals, now forbidden by the laws of this State, nor shall any premium be awarded by said society for any animal on account of its superior speed.

§ 4. This act shall take effect immediately.

On the 18th of June the board of managers met to consider plans and estimates for the proposed improvements. The secretary also presented plans of buildings, which were approved and adopted.

From the time of receiving the deed to nearly the end of July, our time was fully occupied in laying out the grounds, receiving lumber, posts, etc.; and on the 26th of July, the first post was set, and work fairly commenced. No time could be lost, as the first exhibition was advertised to be held September 27th and 28th, 1866.

The amount of voluntary labor, such as digging post holes, grading grounds, and carting lumber, was immense; probably unparalleled in the history of any county society in the United States. The grounds and buildings were ready for occupancy in about seven weeks from the commencement of work.

The gross receipts for the four years since we have permanently located the society, are $50,317.23. Of this amount, the sum of $9,500 was borrowed money at interest.

There have been used in the construction 376,242 feet of lumber and timber, besides floor plank, joists, shingles, lath, etc.

The following is a record of some of the voluntary labor: Seven hundred and fifty days' work of men and teams, not including the construction of the half-mile drive, or filling up the old road; 1,845 locust and chestnut posts, many of them twelve feet long, donated and carted free; 663 trees from Elwanger & Barry, Parsons & Co., Higgins & Sons, B. D. Hicks, Isaac Hicks and Sons, and others; 4,000 well brick, from Charles H. Jones; 385 volumes of books, from Hon. Stephen Taber, Hon. R. C. McCormick, and Hon. John Fox; one well force-pump, from West & Co.; ladies of North Hempstead and Hempstead, flag pole and flags, costing about $400. The donations in cash amounted to over $5,000. Many other articles of considerable value were donated, the particulars of which have been published in the yearly reports.

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In addition to the value of the voluntary labor performed, and the great number of donations made, there has been expended in construction the sum of $24,000 in cash. In a little over two years, $1,539.64 have been paid for interest on loan, and $8,000 of the debt has been paid off. We do not owe, so far as we know, one dollar for any floating debt.

The success of the society has been fully established, and each succeeding exhibition excels the last. We have, no doubt, the best organized society, with the finest grounds, of any county society in the State.

Time and experience have united to convince us that, large as our exhibition hall is, and numerous as our stables and cattle stalls are, they are already inadequate to the increasing demands of exhibitors. The question is no longer asked: "How are you going to half-fill the building and stalls?" but, "What can be done to accommodate competitors?" The time has arrived quicker than we anticipated. The hall must be enlarged, and extra buildings erected. "Coming events cast their shadows before." A great change will soon take place in our surroundings. I think it probable that the rapid march of improvement around us, will shortly call for an entire remodeling of our grounds and buildings.

So much for our past history. Have we not just cause for thankfulness to an overruling Providence, who has so long and so well guided our affairs? May we not hope for a future of usefulness and harmony, by fulfilling our duty to the county and the State, and by inscribing on our banner the cheering legend "*Excelsior*"?

LIST OF OFFICERS SINCE THE ORGANIZATION.

Presidents.

Effingham Lawrence, Flushing	1841 to	184.
Singleton Mitchell, North Hempstead	1845 to	184.
William T. McCoun, Oyster Bay	1847	....
John A. King, Jamaica	1848 to	185.
William T. McCoun, Oyster Bay	1856 to	1857
David R. Floyd Jones, Oyster Bay	1858 to	1859
Edward A. Lawrence, Flushing	1860	....
Daniel K. Youngs, Oyster Bay	1861 to	1862
John C. Jackson, Newtown	1863 to	1865
Samuel T. Taber, North Hempstead	1866 to	1867
Peter C. Barnum, Hempstead	1868	....
Samuel T. Taber, North Hempstead	1869	....
Charles H. Jones, Cold Spring Harbor	1870	....

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Corresponding Secretary.

Albert G. Carll, Jericho..... 1841 to 1846

Treasurers.

Daniel K. Youngs, Oyster Bay..... 1841 to 1845
William Ketcham, Jericho ..... 1846 ....

Secretary and Treasurer.

Albert G. Carll, Jericho..... 1847 to 1849
John Harold, Hempstead..... 1850 to 1870

ADDRESSES.

Addresses have been delivered by William T. McCoun, Daniel S. Dickinson, Gabriel Furman, John S. Skinner, D. P. Gardner, John A. King, John A. Dix, Charles King, James J. Mapes, Caleb Lyon, George W. Clinton, Benjamin P. Johnson, David R. Floyd Jones, William H. Onderdonk, M. R. Patrick, Richard C. McCormick, Abm. B. Conger, Samuel T. Taber, John T. Hoffman.

PREMIUMS GIVEN FOR LARGE CROPS.

1843.

John I. Lott, Hempstead, 103 bushels corn per acre.
Abraham Bergen, Jamaica, 100 bushels corn per acre.
John A. King, Jamaica, 88 bushels corn per acre.
Thomas F. Youngs, Oyster Bay, 81½ bushels oats per acre.
William Ketcham, Jericho, 504 bushels turnips per acre.
Daniel K. Youngs, Oyster Bay, 820 bushels carrots per acre.
John Harold, Hempstead, Scotch imperial oats, 45½ pounds per bushel.

1844.

Thomas F. Youngs, Oyster Bay, 107 bushels corn per acre.
Henry Story, Jamaica, 114 bushels corn per acre.
Daniel K. Youngs, Oyster Bay, 101 bushels corn per acre.
Daniel K. Youngs, Oyster Bay, 79 bushels oats per acre.
Thomas F. Youngs, Oyster Bay, 66 bushels oats per acre.
Daniel K. Youngs, Oyster Bay, 1,124 bushels carrots per acre.
Daniel K. Youngs, Oyster Bay, 772 bushels beets per acre.
William Ketcham, Oyster Bay, 540 bushels turnips per acre.

1845.

Thomas F. Youngs, Oyster Bay, 122 bushels corn per acre.
George M. Hewlett, Hempstead, 120½ bushels corn per acre.
Warren Mitchell, Manhasset, 624 bushels turnips per acre.

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1846.

William Ketcham, Jericho, 560 bushels turnips per acre

1847.

Timothy Nostrand, Jamaica, 112½ bushels corn per acre.
Henry Story, Jamaica, 112 bushels corn per acre.
William Ketcham, Jericho, 628 bushels turnips per acre.

1851.

Townsend B. Pettit, Hempstead, 254 bushels potatoes per acre.

1860.

Allan Macdonald, Flushing, 40 bushels wheat per acre.
G. R. Underhill, Locust Valley, 358½ bushels potatoes per acre.
Daniel Smith, Oyster Bay, 1,000 bushels onions per acre.
George Bradish, Flushing, 800 bushels carrots per acre.
Peter Cock, Oyster Bay, crop of asparagus, on seven acres and seven and one-half rods, yielding 9,155 bunches:

Sold for	$1,922 55
Cost of cultivation	549 75
Profit	$1,372 80

This statement was very full, showing each day's expenses, and was sworn to by Mr. Smith and two witnesses.

1862.

Thomas Youngs, Oyster Bay, 101⅜ bushels corn per acre.
Charles H. and Ambrose Waldron, Matinecock, raised on 111 rods, 134 barrels of onions and 187 barrels of carrots, which they

Sold for	$474 37
Cost of crop and marketing	115 11
Profit	$359 26

Statement verified under oath.

1863.

David Vandegaw, Jamaica, 102 bushels rye on two acres, three roods and fourteen rods.
Jacob Smith, Oyster Bay, crop of onions on one acre, three roods and five-twelfths rods:

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Sold for	$1,095 33
Sale and expenses	405 00
Profit	$690 33

Statement sworn to.

1864.

John R. Burtis, Foster's Meadow, 113 barrels turnips on 4,800 square yards.

Horticultural Show of 1869.

This show was held June 23d. Nothwithstanding the threatening appearance of the weather, the exhibition was an exceedingly fine one in nearly every particular, and the attendance during the afternoon was very large.

The display of flowers was truly a splendid one. Some of the floral designs were extremely elegant in conception, and were most artistically wrought out.

Mr. George Lucas, gardener to T. W. Kennard, Glen Cove, had a larger display than any other contributor, having 120 varieties of roses; also, a large collection of exotics, from Brazil; fine grapes, lemons, oranges, figs and bananas.

William A. Burgess, Glen Cove, exhibited fine roses; Isaac Hicks & Sons, Westbury, roses and cut flowers.

Very fine Barbarossa grapes were shown by Edward McCabe, gardener to Mrs. Brownson, South Oyster Bay.

Elbert H. Bogart, of Roslyn, exhibited forty-eight seedling strawberries, some of superior merit.

The vegetable display was very creditable.

Ladies Festival.

The ladies held a festival on the occasion, which was well managed and a deserved success. The net proceeds ($758.76) were applied toward liquidating the debt of the society.

The Twenty-eighth Annual Exhibition.

The twenty-eighth annual exhibition was held on Wednesday, Thursday, and Friday, September 29th and 30th, and October 1st, 1869, and was the most successful exhibition, both as regards the character of the articles exhibited and the number in attendance, that has ever been held in this county. Some idea of the number of carriages present may be estimated by the fact, that the keeper of

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the toll-gate near Jamaica, received over 500 tolls for vehicles on their way to the fair. This was exclusive of the northern, eastern, or southern portions of the county.

The weather was delightful, neither too hot nor too cold.

Cattle—118 *Entries.*

The show was superior to former years. Premiums were awarded to S. T. Taber, Charles H. Jones, William Norton, Thomas Messenger, William Crozier, R. Ingraham, S. A. Jones, E. Denton, and others, to the amount of $365.

Mr. Crozier made a fine show of Ayrshires and Alderneys.

Horses—161 *Entries.*

A premium of fifty dollars was awarded to Tim. T. Jackson, Flushing, for his stallion, "Superb," and five of his colts. William Crozier, of Northport, received premiums for his imported draught stallions, "Lord Clyde" and "Gen. Grant;" Daniel Y. Jones for "Pearsall;" John A. Fisher, for "Geo. B. McClellan;" E. W. Mott, for "Hero;" and Richard Ingraham, for "Norwood."

Best Brood Mares.—H. T. Willets, and J. R. Willets.

Matched Horses for all work.—George Allen, and Thomas Jackson.

Carriage Horses.—Benjamin D. Hicks.

Saddle Horses.—W. R. Brier.

Geldings and Mares.—Thomas P. Udall, Isaac Burroughs, William Stilwell, P. C. Barnum, A. M. Wood, W. A. Smith, I. W. Arthur, Thomas Winne.

Mules.—Elias H. Seaman.

Pony.—Thomes Clapham.

Four hundred and fifty dollars awarded.

Sheep—70 *Entries.*

Southdowns.—Middle-wooled ram and lambs, William Crozier; Ewes, William P. Douglas.

Hampshire-downs.—Thomas Messenger. Long-wooled, William Crozier, Richard Albertson, S. M. Titus, and William P. Douglass.

Swine.

The first premiums on swine were awarded to Charles D. Leverich, William Crozier, John B. Pettit, Thomas Messenger, P. C. Barnum.

One hundred and one dollars awarded.

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Poultry—206 *Entries.*

The display in this department far exceeded anything of the kind ever before seen in the county. H. Clay Gavit, of Jamaica, was the largest exhibitor, having about sixty varieties of imported fowl, some of rare merit and great cost. Mrs. P. C. Barnum, Samuel Willets, Daniel Brinkerhoff, and Peter H. Bogart, were also large exhibitors. Isaac Weeks, Silas C. Titus, Mrs. W. Norton and John D. Shelton, also received premiums.

One hundred and seventy-two dollars awarded.

Articles for the Table—88 *Entries.*

This display embraced butter, bread, jellies, preserves, pickles, canned fruits, etc. Best butter, Mrs. Sarah D. Schenck, and Miss Van Nostrand.

Fifty dollars awarded.

Grain and Flour.

A large and fine show; twenty-two premiums awarded. The corn on exhibition was presented to Hon. R. C. McCormick, to be forwarded to Arizona.

Vegetables.

The show of potatoes was very large, there being 144 varieties from one exhibitor. First premium, for greatest variety, to Townsend D. Cock; second, to John Brown, gardener to Thomas Messenger. W. H. Vandever, Ascan Backus, William C. Bryant, C. H. Jones, T. E. Burtis and I. W. Arthur, received premiums. Col. A. M. Wood exhibited some very fine peanuts.

Seventy dollars awarded.

Carriages and Implements.

This department was superior to last year. E. Tuthill received first premium for best display of carriages; Robert H. Nostrand for best buggy wagons; George Nostrand, best Rockaway; C. Clackett best farm wagon and rack; J. R. Decatur & Co., best display of implements; F. Nishwitz best harrow.

Joseph Stonebank, of College Point, exhibited an "improved device for converting a wheel vehicle into a sleigh," which attracted considerable attention.

A steam carriage was exhibited on the grounds, which was moved with apparent ease in any chosen direction.

One hundred and thirty dollars awarded.

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Fruit and Flowers.

The show of fruit was fine, especially hot-house grapes, peaches, nectarines and apricots, from Mrs. Brownson. Isaac Hicks exhibited fine apples and pears; Daniel Brinkerhoff & Sons, apples. Samuel Wanser, James Willet, Valentine Frost, Thomas Clapham, Townsend D. Cock, C. D. Leverich, Mrs. B. W. Downing, and Samuel T. Taber received premiums for fine specimens.

The show of flowers was not equal to last year, in consequence of a long drought, yet many choice specimens were shown. A. G. Burgess exhibited 300 specimens of choice dahlias, and A. W. Burgess, fine roses; N. Hallock, fine gladiolus and carnations. Miss P. Taber, best floral design. Mrs. T. W. Albertson, Mrs. E. Titus, John A. King, and Mrs. James Mason, also exhibited fine flowers.

Two hundred and eighty-one dollars awarded.

Needle work—265 *Entries.*

This display included almost every conceivable article made by the hands of the matron or miss. It was considered the largest display in the hall.

A county paper says of this part of the exhibition: "The ladies may well feel proud of their efforts in producing the most interesting feature of the fair."

Manufactured Articles—280 *Entries.*

This department contained a large variety of household goods, among which were many new and valuable inventions tending to lighten labor. E. W. Nichols, of Brooklyn, made a fine display of housekeeping articles and plated ware, taking several premiums. James B. Kirby, of Glen Cove, exhibited superior chamber suits; Manning, Bowman & Co., New York, superior plated ware; White & Co., Brooklyn, hats and caps; Charles Coles and Thomas Lockard, harness; Benham & Stoutenburgh, New York, Japanned ware; Charles Welling, Jamaica, very fine papier-mache goods; Coles Carman, stoves and ranges. About sixty premiums awarded.

The Glen Cove Farmers' Club made an unusual fine show in several classes, reflecting great credit on its efficent secretary, Mr. Jacob T. Bowne.

ANNUAL MEETING.

The annual meeting of the society, was held on Monday, November 29th, at the fair grounds. The president, Mr S. T. Taber, being unavoidably absent, the vice-president, Mr. Charles D. Leverich

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took the chair, and Mr. Jacob F. Bowne was appointed recording secretary.

The annual report was then read by the secretary and treasurer, Mr. John Harold; when, upon motion, it was

Resolved, That the report of the secretary be accepted, and the thanks of the society be tendered to him, for the care and industry with which he has elaborated the report now made, and that the same be printed in the annual proceedings of the society, of which such number shall be printed as the board of managers may deem sufficient.

The society then proceeded to elect officers for the ensuing year, by ballot. Edward A. Lawrence and Isaac Coles were appointed tellers by the chair, when the following gentlemen were elected:

Mr. Charles H. Jones, of Cold Spring Harbor, was unanimously elected president.

Mr. Charles D. Leverich, of Newtown, was re-nominated, and unanimously elected vice-president.

Mr. John Harold, of Hempstead, was unanimously re-elected secretary and treasurer.

Mr. R. E. Thorne, of North Hempstead, was unanimously re-elected director, for three years.

An informal ballot was then cast for a director from Jamaica, in which one hundred votes were cast, of which

James H. Elmore received	36
S. S. Aymar received	27
H. W. Rowland received	22
A. A. Degrauw received	15

After which a formal ballot was proceeded with, when one hundred and eleven votes were cast, of which

H. W. Rowland received	83
James H. Elmore received	28

J. Browne, Jr., of Jamaica, gave notice to amend the constitution, article 10, by striking out the words, "*ten dollars*," and inserting "*twenty-five dollars*," making the sum to be paid for life membership twenty-five dollars.

It was then unanimously

Resolved, That the thanks of the society, be returned to the retiring president, the vice-president, secretary and treasurer, the board of managers of the society, its town commitees and superintendents, for their valuable services during the past year.

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Resolved, That the thanks of the society, be tendered to the ladies for the valuable aid rendered in decorating the hall, and in originating and carrying out the plans for the festival.

On motion, adjourned.

TREASURER'S REPORT—1869.

JOHN HAROLD, *Treasurer, in Account with the* QUEENS COUNTY AGRICULTURAL SOCIETY.

Receipts.

Balance on hand			$247 26
Returned and special premiums			156 00
Rent of grounds and buildings			1,030 00
Donations			943 72
Entrance fees and carriage tickets			3,933 03
Life and annual members, Hempstead		$684 00	
" " North Hempstead		487 00	
" " Oyster Bay		484 00	
" " Jamaica		216 00	
" " Flushing		201 00	
" " Newtown		118 00	
" " out of the county		311 00	
			2,501 00
State treasurer			221 81
			$9,032 82

Expenses.

Premiums and expenses at horticultural show	$381 49
Reduction of debt and interest	3,884 64
General construction	385 26
Fair expenses	1,480 13
Premiums at fall fair	1,831 30
Printing, stationery, insurance and contingent expenses	727 78
Balance on hand	342 22
	$9,032 82

We, the undersigned, do hereby certify that we have examined the treasurer's account, with full and complete vouchers for all expenditures, and find the same just and true. The balance on hand this day is three hundred and forty-two dollars, twenty-two cents ($342.22.)

SAMUEL B. MERSEREAU,
BENJAMIN D. HICKS,
J. BROWNE, JR.,
Auditing Committee.

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The total amount of indebtedness at the present date, is $1,500.

JOHN HAROLD,
Secretary and Treasurer.

RENSSELAER.

Agreeably with a resolution of its board of directors, the twenty-sixth annual exhibition of the Rensselaer County Agricultural and Manufacturers' Society, was held September 20th, 21st, 22d, 23d and 24th, 1869, on the grounds of the society, which are located midway between Troy and Lansingburgh.

The exhibition, we are pleased to say, though not equal to our anticipations was, nevertheless, very respectable in every department, and our gathering would have been pleasant, instructive, and fairly remunerative to the society, but for the unpropitious weather which occurred at the opening, the equinoctial storm, much to our grief, having been fully inaugurated in the afternoon of the second day of our meeting, and so affected our receipts that we are about $500 in arrears.

In regard to amusements, at our annual county fairs, I have this to say: That society which furnishes the rarest, and the greatest amount, and variety of sports for the multitude, or the greatest amount of amusement for its patrons, no matter how deficient the exhibition may be in other respects, is the one most likely, in a pecuniary point of view, to be successful. And, I am happy to say, with the exception of two foot races, one for the boys, and the other for men of seventy years and over, no attempts whatever were made by our society at its last exhibition to furnish recreation or sport for the people.

If the grounds belonging to our agricultural societies are to be desecrated, or used for illegitimate purposes as they have, alas, too often been; or, if they are to be converted into bear-gardens, arenas for the exhibition of circuses, menageries, and other ten thousand nameless things, which are only designed to impoverish, beguile, or deceive us by their seductive influence; why, let us close them for the exhibition of our domestic animals, horses, cattle, sheep, swine; close them for the exhibition of fruits and flowers, grains and grapes, implements of husbandry, the products of the farm and workshop; indeed, close them to everything which is calculated to improve our moral and social condition, lessen the rigor of labor, increase our per-

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sonal and national wealth, ameliorate the condition of our race, and add to the general happiness of mankind.

Again, horse trotting for amusement, or what is worse, for money, is, in our view, an illegitimate business at our county fairs, and a dangerous element to introduce at such exhibitions, although its introduction may add thousands of dollars annually to the receipts of the treasury. Labor judiciously expended on the soil and in the workshop, or in the breeding of horses, cattle and sheep, is of greater value to the community at large than the highest attainments in the ignoble art of training horses for the most unworthy of all purposes, the track. The former adds to a nation's wealth; the latter contributes alike to its poverty and immorality. Alas, the passion for horse racing has become chronic, and threatens to become subversive of the best interests of our county and State associations. Let us go back to first principles, and discard everything that is extraneous or of doubtful utility in our annual exhibitions, and we shall at least retain our self-respect although our gatherings may not be invariably a pecuniary success.

The annual address was delivered by Major-General Gates, of Ulster, and it was an able address, abounding in practical thoughts and suggestions, and was creditable alike, to the speaker and the society. The address has been published in pamphlet form, and it will be widely distributed throughout the county.

I am pleased to say, in addition to what has been stated above, that the exhibition of horses, fruit and flowers, at our last annual meeting, surpassed that of last year very considerably, and was quite respectable in each department.

The hay crop throughout the county was very large, as was also the potato crop, though the latter, we regret to say, was nearly ruined by the rot; the peachblow, of all the various kinds, suffering the most. The corn crop, as compared with last year, was small; but of oats and winter grain, there was a fair, but not an abundant yield.

Our annual meeting, for the election of officers and for other purposes, will be held on the 18th instant.

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FINANCIAL CONDITION JANUARY 6, 1869.

Expenditures.

Paid amount due treasurer last report	$327 94
outstanding bonds of the society and interest	306 63
preminms of 1868	191 01
premiums of 1869	445 50
all other disbursements	1,999 89
Cash on hand	277 13
	$3,548 10

Receipts.

Received from State of New York	$438 75
on bond and mortgage	1,858 88
from all other sources	1,250 47
	$3,548 10

We think that the outstanding bills against the society, and the amount due exhibitors for premiums, will quite absorb the cash on hand, and possibly leave the society, as last year, a little in arrears.

In September last, two weeks after our annual exhibition, we had the misfortune to lose "Floral Hall," our central building, by fire; by which we sustained a loss of at least one thousand dollars. It was evidently the work of an incendiary.

The premiums offered to exhibitors this year by the society, were considerably less than they were last year, and the amount actually awarded, was between five and six hundred dollars.

OFFICERS FOR 1870.

President, Jas. R. Fonda, Troy; Secretary, S. K. Stowe, Troy; Treasurer, G. Waters, Troy.

S. K. STOWE,
Treasurer.

RICHMOND.

The past has been an eventful year in the history of the Richmond County Agricultural Society, and in taking a retrospective view of t, the members have reason to congratulate themselves on its prosperous condition to-day, as compared with a year ago.

The close of 1868 was disastrous. Bills were unsettled, premiums unpaid, diplomas undistributed; the books could not be obtained, the

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society utterly bankrupt, and a wide spread and deep seated prejudice existed in the minds of the community against it. Many of its most valuable members had withdrawn, its most enthusiastic grown lukewarm. At the last election, a new board was the result; and against all these disadvantages, a new administration set their energies to work to make the society a success, retrieving its ill fortune, redressing grievances, reconciling differences, restoring it to the place it had once occupied in public opinion and placing it upon a sound financial basis. In the words of its treasurer, "to make both ends meet *and lap*;" and, in the spirit evinced by its president, "every dollar of indebtedness must be paid, if I have to do it out of my own pocket." Reform, retrenchment and economy were the order of the day. All unnecessary expenditures were curtailed, and the closest economy exercised in the disbursement of the funds. In addition to the regular fall fair, a velocipede race, a trotting match, and a horticultural fair, were instituted; and by the aid of these, and dint of good management the society is again in a solvent condition. To-day with every dollar of obligation (except a few unaudited bills) discharged, and a balance, small though it be yet still a balance, in the treasury, good feeling restored and credit unimpaired, it may well feel proud of its success, and assured that the coming year will be one of at least equal prosperity.

Among the transactions of the society may be mentioned, the velocipede race, at which a silver cup and gold and silver medals were awarded as prizes; it at least paid expenses, and advertised the society. The horticultural fair (June 18th and 19th), a new enterprise, and which it is proposed to make a feature, hereafter, was received with decided favor, and considering the short notice at which it was gotten up, the display of flowers, plants, strawberries, etc., was very good. The trotting match between private horses of members of the society, was also a fair success, and the two added to our funds some $150.

The fall fair, in quality and variety of articles exhibited, was fully up to the standard of previous years, though the number of contributors was not nearly what it should have been in a county of over 30,000 inhabitants. Many causes contributed to this lack of interest, among others, the unpopularity of the society, though we hope the coming year, through the result of this, to show a much larger number of competitors, and consequently to enhance the attractiveness of the fair.

The programme embraced racing every day, a base ball match for

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a silver ball, and an address by Rev. Dr. Kingston Goddard. The attendance was large, though from the low price of admission charged (twenty-five cents), a much smaller sum was realized than what should, and otherwise would have been. The premium list had been amended and the premiums put at a figure at which we could make sure of paying them, and the extreme liberality of many contributors in donating to the society the premiums awarded them, materially aided the efforts toward solvency.

Mr. Eugene Britton was elected treasurer, vice Canavello, resigned April, 24th, and Mr. J. H. Seguine, vice-president, vice Britton, resigned; Mr. Kellett was elected recording secretary August, 19th, vice Davis, declined.

The following is a statement of the yield of the island, as near as I could arrive at it, taking the experience of the county farm, which is in the center of the island, on good ground, and probably as fair a sample of the county as well could be:

Hay per acre	3	tons.
Corn per acre	75	bushels.
Oats per acre	45	"
Wheat per acre	22	"
Rye per acre	23	"
Potatoes per acre	275	"
Carrots	175	"
Turnips	350	"

The officers of the Richmond County Agricultural Society elected February, 12th, were as follows:

Samuel Barton, president; Eugene Britton, treasurer; Henry Metcalf, corresponding secretary; Wm. W. Kellett, recording secretary.

Cash Exhibit of the Richmond County Agricultural Society for Year 1869.

Balance from 1868	$164 90
Receipts from velocipede race	74 00
horticultural fair	103 21
trotting match	87 79
fall fair	614 85
season tickets	625 00
premiums returned, etc	313 00
tents, renting	100 00
sale of lumber	179 14
	$2,261 89

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Paid for printing and stationery	$121 86
outstanding bills, 1868	293 05
expenses velocipede race	69 71
expenses horticultural fair	37 58
expenses fall fair	187 26
premiums trotting, etc	794 00
board bill, music and help	119 90
hire of tent	100 00
lumber transportation, etc	375 66
band of music	90 00
feed for stock	52 50
Balance January 1, 1870	20 37
	$2,261 89

W. W. KELLETT,
Secretary.

ROCKLAND.

The annual fair of the Rockland County Agricultural Society was held on the society's grounds at New City on the 29th and 30th days of September.

The first day was devoted to making entries and arranging articles, which were examined by the different committees in the after part of the day.

The annual address was delivered in the morning of the second day by Rev. C. J. Page, of our county. The rest of the day was devoted mostly to trials of speed of horses.

The display of horses, both for show and speed, was never better, as was also that of cattle, both of native and blooded stock.

A special premium of a silver medal was offered by John Salisbury, of our county, for the best blooded fowls of any breed; which was awarded to Jabez Wood, Esq.

The society was never in a more prosperous condition than at present.

The following officers were elected for the ensuing year: President, Isaac Pye; Secretary, Isaac E. House; Treasurer, Abram A. Demarest.

TREASURER'S REPORT.

Receipts, 1869.

From State	$82 75
Subscriptions	147 00
Fair	581 10
	$810 85

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Disbursements.

Premiums paid	$531 40
Expenses	148 10
Paid treasurer amount due	69 83
Balance on hand	61 52
	$810 85

ISAAC E. HOUSE,
Recording Secretary.

ST. LAWRENCE.

The society held its eighteenth annual fair on the society's grounds, at Canton, on the 14th, 15th and 16th days of September last. The weather being favorable, the exhibition was all that could be desired, and in every sense a perfect success. The show of blood stock was larger than ever before, especially in Ayrshires. There was a fair exhibition of short-horns. In native and grade cattle the show was large and fine. In working oxen and fat cattle it was truly wonderful. Four red fat oxen were beautiful specimens. The society has erected during the past season a building for the exhibition of mechanical works, at a cost of $1,200, which is a great convenience to those exhibiting mechanical works, as well as an ornament to the grounds. In the dairy hall there was a fine display of all kinds of farm produce, with the single exception of garden vegetables, owing to our cold, backward season, and the fact of our holding the fair earlier than usual.

The hay crop of St. Lawrence county was extremely heavy, and was well secured. There is also a heavy crop of coarse fodder. The grain crop, as a general thing, was more than an average for us here, and was also well secured. September being so warm and pleasant, the corn had a chance to get ripe, and the stalks were well cured in the stook, and will afford considerable feed; but I think it will all be used up. Farmers are now feeding freely, and have been since the 22d of October, full seven months. This year cows have got to be fed freely, and, with the large stock of cows and other cattle, it will require a large amount to carry them through. Spring wheat, oats and barley, when not on low ground, where the water stood the first part of the summer, are considerable more than our average crop. Potatoes are also a heavy crop; but some kinds have rotted very

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badly. In relation to the two barrels of spring wheat, sent here by the State Society, it was given to two different parties to sow. The crop was much alike in both cases, and both parties now think it may yet prove a good variety for this region; but I did not require them to sell it for seed wheat, for the reason it was mixed with two other kinds of wheat. But in harvesting it they each secured sufficient to seed an acre next spring of the pure seed.

TREASURER'S REPORT.

Receipts.

1870.

State	$414 38
Fair	4,689 67
Other sources	1,738 00
	$6,842 05

DISBURSEMENTS.

Salary of secretary 1868 and 1869	$200 00
Printing and other expenses	329 31
Labor, supplies and other expenses of fair	732 00
Buildings, repairs, etc.	1,366 04
Settlement of old claims against society	100 00
Band	112 00
Address	100 00
Trotting premiums	840 00
Other premiums	1,310 00
Balance	1,752 70
	$6,842 05

GEORGE ROBINSON,
Secretary.

November 17th, 1869.

SARATOGA.

The president of the Saratoga County Agricultural Society respectfully reports, that no returns have been made to him within the past year, by successful applicants for the premiums of the society, as required by the third section of the act under which it was organized, and consequently he has none to transmit to the State Society.

The following is an abstract of the proceedings of the executive committee of this society during the past year:

The first meeting of the board was held on the 31st day of May, when the time was fixed for the annual fair, viz., September 7th.

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8th, 9th and 10th, on the society's show grounds in the town of Saratoga Springs.

A resolution was adopted to the effect, that no annual membership could be perfected after the books of entry were closed on the evening of the first day of the exhibition. A premium list was adopted, offering many prizes, amounting in the aggregate to $1,646.87.

On agriculture proper	$36 00
On horses	194 00
On cattle	346 00
On sheep	308 00
On swine	69 00
On poultry	20 50
On mechanical productions	132 00
On agricultural implements	54 00
On dairy products	24 00
On fruit	35 00
On garden vegetables	29 50
On household productions	53 50
On painting, drawing, embroidery and needlework	70 50
On flowers	59 37
On canned and pickled fruit and vegetables	17 50
On trial of speed of trotting horses	175 00
On miscellaneous articles	25 00
	$1,646 87

The next meeting of the board was held on the 7th day of August, when some alterations were made in the premium lists. A general superintendent of the exhibition was appointed, with instructions to repair the show grounds and buildings, and have everything in readiness for the coming fair.

A committee was appointed to make arrangements for agricultural discussions during the fair, select the subjects, and see that the arrangements were carried out.

The Twenty-eighth Annual Fair.

First Day. This day was set apart for registering and arranging articles and property for exhibition, when the gates were closed to all but exhibitors and officers of the society.

Second Day. The gates were opened to visitors at eight A. M. Although the resolution, closing the entries at six P. M. of the first day had been timely promulgated, it became apparent in the early part of the forenoon that many exhibitors were still back, and would come in if the term was extended, which was accordingly done, until twelve o'clock.

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The following is a comparative statement of the entries in the several classes upon which competition had been invited for 1868 and 1869:

Class.		1868.	1869.
1,	Agriculture proper	26	23
2,	First class horses	50	70
3,	Second class horses	29	63
4,	First class cattle	45	54
5,	Second class cattle	21	24
6,	Spanish Merino sheep	22	15
7,	Long-wool sheep	13	25
8,	South Down sheep	None	4
9,	Grade Merino sheep	8	13
9½,	Grade coarse-wool sheep	5	19
10,	Swine	8	20
11,	Poultry	33	84
12,	Mechanical productions	36	77
13,	Agricultural implements	26	13
14,	Butter and cheese	9	10
15,	Fruit	19	51
16,	Garden vegetables	71	65
17,	Household productions	103	69
18,	Painting, drawing, embroidery and needle-work	132	93
19,	Flowers	35	49
20,	Canned fruit and pickled vegetables	28	51
21,	Trial of trotting horses	14	10
22,	Miscellaneous articles	44	95
23,	Foreign entries	30	15
		807	1,012

The judges were called at twelve o'clock, vacancies filled, and the books of entry delivered preparatory to making their examinations.

Third Day. This, as is usual, was the great day of the exhibition, and long before noon the show grounds were filled with the vast multitude who came from the surrounding country to participate in this our farmers' festival.

The judges were promptly on the ground, and finished their labors in time to submit their reports to the board of managers before the hour for reading and awarding the premiums.

The society was called to order by the president at two P. M., and on his invitation the Rev. Dr. John Woodbridge offered an appropriate prayer for the prosperity and success of the society, and the peace and happiness of the whole people.

The committee to nominate officers of the society for 1870 was then announced by the president, with instructions to make their report at the adjourned meeting to be held on Friday, at 2 P. M.

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Charles S. Lester was then introduced as the speaker chosen to deliver the annual address on this occasion.

As this address is appended to, and is made a part of this report, it is only necessary to say that it was listened to with delight and satisfaction by the entire multitude of people, who had gathered around the speaker's stand to witness this interesting part of the exhibition.

At the conclusion of the address, the following resolution, offered by J. W. Eddy, Esq., was unanimously adopted:

Resolved, That the thanks of this society and its board of managers are due, and are hereby tendered, to Mr. Lester for the able and instructive address delivered on this occasion, and that a copy thereof be requested for publication with the transactions of this society.

Fourth Day. The weather, which had been rather unfavorable on the previous days, was still more so on this. The rain commenced in the morning about the hour for starting to the fair, and continued with intervening showers until mid-day. This changed the entire programme for that day, and reduced the anticipated receipts several hundred dollars.

At 2 P. M. the society was called to order, when the nominating committee submitted the following as the ticket to be supported for officers for the year 1870:

President—John Titcomb, of Waterford.

Corresponding Secretary—James Thompson, of Milton.

Recording Secretary—Jonathan S. Howland, of Saratoga Springs.

Treasurer—Milo J. Jennings, of Saratoga Springs.

The reports of the judges, or viewing committees, as approved by the board of managers, were then read and premiums awarded in the different classes.

The next meeting of the board was held on the 13th day of December, when a committee was appointed to make arrangements for opening a regular sale of stock and farm produce at the future fairs of this society, and to report at the next regular meeting of the board.

The treasurer was directed to make a temporary loan of $800, to pay the premiums and incidental expenses of the fair.

The following resolution was unanimously adopted:

Resolved, That the thanks of this society and its present board of managers are due to the Hon. DeWitt C. Hoyt, our retiring president, for his energy and efficiency in discharging the arduous duties of presiding officer for the past year, and for his uniform courtesy, kindness and liberality in all his intercourse with all the members of this society.

The board then adjourned.

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AGRICULTURAL DISCUSSIONS.

One of the most interesting, and withal the most instructive, features of our annual fair was the public discussions held on the evenings of the second and third days. The subject selected for the first evening was, "Are the agricultural interests of this country promoted by encouraging the importation and home breeding of thoroughbred and blooded stock, to the exclusion of the native breeds?"

Hon. William T. Odell, being called upon to read an essay, stated that he was not prepared to comply with that request, but he would, with their consent, utter a few thoughts on the subject of the agricultural interests of the county. He claimed that farming was one of the most honorable and important of occupations, and farmers' sons should be educated intelligently to follow their vocation.

Mr. Odell then proceeded to speak at length of farming in Saratoga county. He had observed that farms had "worn out" faster in the last ten years, than before in the same period. One cause was the market which the war furnished, and the consequent high prices, which induced the farmer to sell everything he raised, without returning anything to the soil. Another was the manufacture of paper from rye straw, the value of which for that purpose had prevented the feeding of straw, and the consequent return of the elements composing it back to the farm. If farmers had taken only a portion of these profits in purchasing fertilizers the land would not have suffered so seriously. He mentioned an orchard, in the north part of the county, which he knew produced great crops when he was young, and now he was informed yielded nothing because the potash was gone from the soil. This exhaustion had been too much overlooked. There are now hundreds of acres, south of Rowland's in Milton, which are a barren waste, which formerly yielded good crops.

Mr. O. spoke of the value of muck beds, and related an experiment which he saw tried over thirty years ago, which conclusively showed that muck (except pine washings), if drawn out and allowed to remain a year, was a most valuable fertilizer. When green, it contains acids detrimental to vegetation. As to what could be done most profitably here, he was not, perhaps, a good judge, but as we could not successfully compete with the west in raising cereals, he was of the opinion that grazing, and raising of stock, would be found most profitable.

Hon. Chauncey Boughton, of Waterford, stated his views on the question of the evening. He took the ground that the best results to be obtained were by a judicious system of crossing. Any good

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breed would soon become extinct without a careful mingling of different bloods.

Mr. F. D. Curtis, of Charlton, claimed that our business was one of facts, rather than theories. If the 517 colts raised in Saratoga in 1865, had all been blooded animals, their value would have been vastly increased. He thought it was unnecessary to argue that thorough-breds were better than common animals. Their superiority lay in their blood. Mr. Curtis still further showed by facts and figures how much would have been gained to the county if the calves, milch cows, and cattle had been of improved blood. He illustrated by some facts the great value of good blood in cattle. He emphasized the advantages to be derived from sheep breeding in this section. In this respect the west could not compete with us. His own lambs sold for fifty cents a piece more this year than last on account of a cross with the Leicester breed. As we plant the best seed, so it was reasonable to take the best stock. We seek to improve the human family, but it was unreasonable, if the theory of improvement of stock was wrong.

Mr. J. P. Conkling went back to the origin of the question, and claimed that the Morgan horse, a native horse, was the best for all purposes. He thought that imported breeds should not be adopted at the expense of native breeds. The expense and trouble of breeding fancy stock more than ate up the profits. He was not, however, against imported stock. As to milk, he cared more for the *pints* of milk than the "*points*" of breeding. The true way to improve stock was to keep the heifers of your best cows, and this would insure good dairies. The same was true of sheep, and poultry. He was not opposed to thorough-breds, but he believed in giving the native breeds a fair chance. The Morgan horse *had* done the farmer great good but what good had the fast runners that are brought here to our racing track, ever done to the farmer? He did not, finally, believe in the *exclusion* of native stock.

Mr. Odell thought that if the question turned upon the exclusion of native stock, Mr. Conkling had the best of the argument. He thought the question of climate ought to be considered in favor of the native breeds. But where do we get our blooded horses? It is by a judicious mixing of breeds as was seen in the English blooded horse, the result of judicious crossing. The best result was achieved by crossing the best foreign with the best native.

Mr. J. D. Briggs, of Saratoga Springs, thought that it was almost time to stop importing stock altogether. The original stock of

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horses brought to this country was the excellent horse bred up by the old English agriculturist. He thought we had already the elements of the best attainable stock. Mr. Briggs disparaged somewhat the utility of the racer, while the best trotters were of native production. He thought the tendency of our fairs to award premiums to foreign stock to the exclusion of native stock was an error.

Mr. Odell suggested that the offering of premiums for grade stock would develop an American breed equal or superior to imported breeds.

Mr. Briggs emphasized the influence of climatic influences on the breeding of stock. He thought the value of the thorough-breds was overestimated. He instanced the speed and endurance of the common horse that Phil. Sheridan rode, as proof that we have the elements of a good breed in our native animals.

Mr. Lester thought that justice had not been done to the thorough-breds. Assuming that the thorough-breds were acknowledged better than the native breeds, he thought it was economy to take the best already developed, rather than to attempt to build up a good breed out of poorer stock. Mr. Lester adduced some very strong facts in his own experience in favor of thorough-breds. He thought it was logical to take the best.

Mr. Conkling believed we ought to do as the English did, build up a good breed, an American breed of our own.

Mr. Lester thought it was not good sense to waste our time in doing over again what England has already accomplished.

Mr. Conkling made an earnest speech in favor of Yankee products generally. He would yield to no nation in this respect. He moved, then, that the society offer the highest premiums for the best native or grade cattle.

Mr. Lester moved to omit the word native or grade, which was lost, and Mr. Conklin's motion carried.

Adjourned till this evening.

Thursday Evening.

The attendance at Hathorn's hall was not large, doubtless owing to the rain, but much interest was manifested by those present.

Mr. A. H. Palmer took the chair at eight o'clock and announced that the exercises would be opened with an essay by Mr. J. P. Conkling of Edinburgh.

Mr. Conkling, on rising, remarked that he had not prepared a written address, but would claim the indulgence of the audience while

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he presented a few suggestions. The question "What crops shall we grow so as to improve our land, and at the same time afford the most profit?" was an important one. The speaker thought it would depend much upon our markets, upon the law of supply and demand. None of our crops need necessarily deteriorate our soil. He referred to the northern part of the county as a superior grazing country, and advised the farmers of that section to put as much land into meadows as possible; to improve their barns and barnyards; to use their muck for absorbents of liquid manure, and thus pay the debts they owe to their land. Concerning the sand lands, he could, he thought, treble their value.

He referred to the farm of Mr. Roesle as an instance of what could be done with a sand farm. Turn under, for a couple of years, a crop of Russia buckwheat, manure highly, and he would vouch for the result. As to the remaining lands, the clay lands, devoted mainly to the potato, he thought it was a crop dependent mainly for success on the high rates of freight from the west. But better than this the speaker thought would be the raising of lambs, chickens and small fruits, for our unrivaled Saratoga market. It should not be overdone, but could be made profitable morally and mentally as well as financially, if something like the co-operation plan were introduced into the family, allowing son, daughter, and wife to have a particular branch to him or herself. Give one the poultry, another the lambs, or the fruit, or the calves, and above all else make your home the pleasantest spot on earth. Talk with your children. Do everything you can to make your home cheerful. Give them a "posey bed" in summer, or the best rig for a sleigh-ride in winter. Do your best with your land. He referred to the farm of Mr. F. D. Curtis as a specimen of what a farm of only 110 acres could do. He had the largest exhibition of stock at the fair. A few bees cost little trouble, and yet their honey was always marketable. Mr. C. emphasized the necessity of order on the farm. Save your best seed, always; and do not fail, he said, to raise a good crop of sons and daughters. He suggested that the officers of the society be elected annually by towns, and in conclusion urged that the annual fair be made more generally a medium for the sale or exchange of seed, stock, etc., a sort of Farmer's exchange.

Mr. S. P. Briggs of Saratoga Springs, then opened the discussion. He referred to the great variety of soils in the county. For the soil along the river, the alluvial, he recommended simply a reasonable rotation of crops. For the light clay soil a little further back, the

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system of rotation was also successfully adopted. For one, stock raising was the best; for another, plowing. It was not good policy to rely on any one crop, exclusively. A proper rotation of crops was perhaps the best general policy. He thought that the transportation of potatoes from the west would reduce the price of that particular vegetable which was so extensively cultivated in this section. But he would not advise its entire abandonment. He thought farmers could afford to sell their straw for fifteen dollars, if they but saved for fertilizing agents four dollars out of that sum. Let the farmer look mainly to the improvement of his farm, and he would find his reward in its future products. He did not think our county was deteriorating agriculturally, but that it was improving.

Mr. F. D. Curtis spoke for Charlton, and urged the cultivation of a "crop of ideas;" a little more calculation in farming. He had brought his farm, as much as possible, down to grass, had sacredly saved everything in the shape of a fertilizer, and last winter, with a large stock, had not been obliged to buy a pound of hay. He urged ideas, calculation, system.

Mr. Conkling asked explanation of a phenomenon he had witnessed in Warren county, where a gravel soil had been thrown up from an excavation, and had acted as a powerful fertilizer.

In reply Dr. R. L. Allen of Saratoga Springs, explained the geological composition of soils, and attributed the phenomenon mentioned to the exposure of richer mineral elements. Dr. Allen spoke of the immense amount of vegetable substance that is carried each year down the Hudson and its confluents, and wished that it might be economized. He thought farmers needed to study the nature of their soil, and then save their manures, and prevent their decomposition in ammonial exhalations. He urged the preservation of the grand parks or forests in the northern part of the county, and to that end even would exempt them from taxation.

Hon. W. A. Sackett desired an explanation of the reason why "seeding down" worn out land restored its strength? He thought more time should be devoted to ascertaining the causes of certain acknowledged effects. It seemed to him that it be better to decide what soil was the best for a given crop. It would make the results of these discussions more definite.

Mr. J. L. Cramer of Saratoga Springs, called attention to the fact that the best lands in Saratoga, were the low lands, and mentioned his success in reclaiming an alder swamp on his own farm. His returns had already repaid him for his outlays in draining. And

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there are many other lands of the same character in the county. He thought grass was, all things considered, the best crop that could be grown.

Mr. Lester made some clear and pertinent remarks explanatory of the fertilizing influence of "seeding," or leguminous crops. Clover draws strength from the atmosphere, while its roots dissolve certain otherwise insoluable minerals in the soil.

Mr. A. B. Olmstead thought that the phenomenon spoken of by Mr. Conkling was an apt illustration of the value of subsoiling.

Mr. Briggs made some suggestions concerning drainage, after which the meeting adjourned.

In thus transmitting the formal history of the proceedings of this society for the past year, we should be unmindful of our duty as its official organ without submitting a few observations upon the general condition of agriculture in this county, and more particularly of the yield of the various crops and farm products within the past year.

The year now closed has not been very favorable to the agriculturists of this county, nor indeed in all this region. We had an abundance of rain throughout the season, so much so that it may be recorded as "the rainy summer." Rye and the early sown crops came forward and ripened tolerably well; but the planting of corn and potatoes, two of the leading staples, was delayed beyond the usual period, and as a consequence they were late in coming to maturity. Except on the sandy uplands, these two crops were regarded as failures. Rye and oats produced an average yield; and wheat, where our farmers had the courage to try it, did exceedingly well. There has been an evident change in the seasons in regard to wheat growing, and from recent trials with this important crop, it is quite certain that wheat may, with proper culture and carefully selected seed sown on fertile soil, be as successfully grown as any other grain.

Buckwheat, which has become one of the staples of this county, promised a very good yield; but, like all the other spring and summer sown crops, it was overtaken by the excessive fall rains, which retarded the harvest and materially injured all kinds of crops on the low, wet lands.

The potato crop, which has usurped the place of corn for several years past, was promising in the fore part of the season, and the yield would, no doubt, have been exceedingly large but for the fall rains and high water, which submerged whole fields, and in many instances delayed their gathering until cold weather, accompanied by frost, finished the work of their destruction, which the freshet had begun.

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Fortunately, however, for consumers, almost every farmer had embarked in the business of potato growing, and the supply so far exceeded the demand that the market was well stocked, with prices reduced much below former years, and a large surplus on hand to be disposed of in the spring. If, from these untoward causes, less attention is hereafter paid to this crop and more to wheat and rye and corn, much good may result from the lesson which our potato growing friends have learned, and they can look back upon the potato *mania* as a delusion of the past.

The hay crop was better than usual, and the yield was much larger than in any former period for several years past.

It may be noted as a fact in the history of this county that wet seasons are always more favorable to agriculture than dry ones. All grass lands stand excessive rains and produce larger crops than when visited by long summer droughts; while the uplands, principally sand, are not affected by the rains to the same extent as many other counties. A general system of drainage, too, is being applied to all the arable lands of clay formations. The hilly regions, which constitute a considerable portion of the county, have their natural drainage, and hence the whole county is better protected from such excessive rains as it experienced last summer and fall than many other parts of the State.

Highly favored with every variety of soil adapted to the growth of all the cereals indigenous to the latitude, with an invigorating and healthy climate, and a location reasonably accessible to the great markets, the farmers of this county manifest their appreciation of these advantages by a steadfast devotion to their farms and the dignified pursuit of agriculture, the first and the most honorable employment of man. The instances are rare, indeed, where a Saratoga county farmer seeks to better his condition by migrating to other parts of the country with a view to follow his profession. Where one goes out two come in; and instead of witnessing a declining state of agriculture, it is steadily increasing, and all our farming lands are in a higher state of cultivation to-day than at any previous time.

Agriculture is science, recognized as such by all intelligent farmers, without a knowledge of which they make but little headway or progress in their profession. The promise of "seed-time and harvest" is of little avail if the husbandman fails to observe the return of the seasons, and the operations of nature's laws upon the whole vegetable kingdom. There is an appropriate time to sow and to reap, and

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unless this is carefully observed it is vain to look for success in tilling the earth. Mind governs matter; and there is no other occupation of man so exacting of thought, and requiring the proper exercise of the mental powers, as that of cultivating the soil. It is a constant communion with nature, and a familiarity with the order which nature displays in her wondrous workings in the material world.

There is no real necessity for making the life of a farmer one of drudgery and incessant toil. A portion of his time may be more profitably spent in thought and meditation, in devising the ways and means for lessening his labors through inventions and the application of labor-saving machinery, whereby the labor of one man will do more and accomplish more in the management of his farming operations than half a dozen could do by manual labor alone.

The farmers of this county are becoming theoretical as well as practical; and when these qualities are united in one person, his influence is felt, and his example for good is very apt to be contagious, and followed by other farmers who see his practical, successful application of new theories to old forms. An afternoon or evening assemblage of farmers engaged in the free discussion of agricultural topics, in which every farmer is at liberty to tell his own experience in his own way, is a much better appropriation of time than many of the annual gatherings at the public fairs, gotten up, as they often are, in the interest of horse racing, hotel keeping and mere money-making schemes. Farmers' clubs are springing up all over the State, and are becoming useful agencies in promoting agricultural science. They are the mental power, acting upon, and moving the material world; and it is encouraging to know that our agricultural fairs are introducing this interesting feature as a part of their exhibitions, and that their discussions are attracting the attention of the farmers and friends of agriculture throughout the State.

These local clubs, organized for the mutual improvement of their members, are so many normal schools to prepare teachers for wider fields of instruction; and already their discussions constitute a valuable part of the yearly transactions of the State Agricultural Society. It is at these neighborhood meetings of practical farmers that the results of individual experiments are brought together and compared, new discoveries are communicated, errors are combated, and a higher standard of education in the science of agriculture is thus established wherever these associations exist.

If these farmers' clubs were organized in every town in the State, we should soon see agriculture recognized as one of the learned pro-

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fessions, more honorable and withal more inviting than any other pursuit in the range of civilized life.

J. A. COREY,
Secretary.

SARATOGA SPRINGS, *December* 30, 1869.

ADDRESS DELIVERED BEFORE THE SARATOGA COUNTY AGRICULTURAL SOCIETY, AT ITS ANNUAL FAIR, AT SARATOGA SPRINGS, ON THE 9TH DAY OF SEPTEMBER, 1869, BY CHARLES S. LESTER.

Mr. President and Gentlemen of the Saratoga County Agricultural Society, and Ladies and Gentlemen.—I hope you will believe me sincere when I assure that in the presence of so many intelligent farmers who have made agriculture their study and pursuit I feel very sensibly that the selection of a person whose agricultural experience has been so limited as my own to deliver the address on this occasion was not entirely judicious, aware as I am of my inability to give you such practical and entertaining instruction as has been so often delivered from this stand.

It is not the first time, however, that the question has arisen, why other than practical farmers are so often called upon to deliver addresses before societies of this character, for while a lawyer might hesitate to lecture on medicine, or a physician might decline to deliver an address on municipal law or even a politician might shrink from endeavoring to enlighten his "fellow-citizens" on some abstruse question in theology, we all of us seem to consider ourselves somewhat qualified to discuss the subject of agriculture.

Perhaps one reason is that agriculture is the foundation and beginning of all other pursuits. It lies back of all trades and professions. Its prosecution is necessary for our existence as individuals and our prosperity as a nation.

It is the one indispensable pursuit, for a man may struggle through a fever without the aid of a physician but he must have his gruel; he may get along without a residence fitted up with all the modern improvements of a first class dwelling, but he must have his corn and potatoes. Jewels and costly raiment are of no account without bread and butter, and no profession can be followed or pleasure pursued unless the farmer furnishes the staff of life.

Aside from the importance into which necessity has elevated the calling of the husbandman, rural pursuits have in all ages been the choice of the wisest, the most illustrious and the most refined of mankind.

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The agricultural patriarchs of the old world, the shepherd kings of Israel, the prophets who sat each under his own vine and fig tree, have been the theme of elevated song and enchanting story. The noblest legend of ancient Rome is that of the patrician farmer Cincinnatus, who, at his country's call, left the plow standing in the furrow of his native fields to assume the insignia of absolute power, and when the danger to the early republic had, by his courage and ability, been averted, laid down his dictatorial power to resume his labors upon his farm.

So afterwards, in the Augustan age, the zenith of Roman power and greatness, the poet Virgil, celebrated the pleasures of pastoral life in poems, which for more than 1,800 years, have been regarded as the most delightful pictures of the pleasures of agriculture.

Not to mention other distinguished names, Burke, the famous orator and statesman of England, sought out the retirement of a farm for repose from his arduous labors and in the inspiring shades of Beaconsfield composed those splendid orations, which stirred up the heart of England, and made his name immortal.

So, too, in our own land, and almost in our own time, our beloved Washington, retiring from the cares and labors of official life, sought at Mount Vernon, in the language of his biographer, "that haven of repose to which he had so often turned a wishful eye throughout his agitated and anxious life, and where he trusted to pass quietly and serenely the remainder of his days;" as he himself said in a letter to a friend: "Having turned aside from the broad walks of political, into the narrow paths of private life, to make and sell a little flour annually, to repair houses going fast to ruin, and to amuse myself in agricultural and rural pursuits will constitute employment for the few years I have to remain on this terrestrial globe."

The attachment of Jefferson to his farm at Monticello; of Clay to the broad acres and well bred herds of Ashland, and of Webster to the meadows of Marshfield, are familiar to you all.

Thus, in all ages, agriculture has been the delight as well as the support of mankind. To watch the budding fruits through the circle of the seasons, to train the vine, to reap the ripened grain, to gather the luscious fruits, to win from the genial bosom of mother earth her treasures of fatness, and to watch the increase of flocks and herds, are the elevating, the healthful, the natural pleasures of our race. As if, through the march of ages and the coming and going of untold generations, there was transmitted an instinctive recollection of that happy hour when, in the newly created world, "The Lord God took the

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man and put him into the garden of Eden to dress it and to keep it." As if, in such pursuits, we unconsciously tasted some portion of that unalloyed happiness, which once our race enjoyed, and which we may again acquire when the whole moral, as well as physical wilderness of this world, shall be made to blossom as the rose, and, in the bowers of a regenerated world, enjoy the delights of a recovered Eden.

The importance of agriculture in advancing civilization and in increasing the power and population of a nation may be very forcibly illustrated by a brief glance at the history of this county, where today, in the grounds of this society, are collected meritorious specimens of our vegetables, grains, domestic industry, fruits, flowers, machinery, cattle, horses, and other products, and an assemblage of the farmers, mechanics, and traders to exhibit and inspect, to relate and to hear the interesting features of agricultural development.

But little more than 100 years ago and this county was the hunting ground of a few roving Indians. Its pine plains were barren of agriculture and uninhabited except by the savage and his game.

Then came the hardy pioneer, cutting down the forest and putting in his few and simple crops, wrestling with the wilderness, occasionally driven back by the warlike Mohawks but in the end conquering both.

Hillsides were cleared and sheep and cattle took the place of roving game. The valleys were plowed and the forests gave way to fields of grass and waving grain.

The streams, no longer monopolized by the solitary canoe of the swarthy savage, resound with the plash of water-wheels, the noise of machinery, and the hum of the spindle. Hamlets and villages grew up and dotted the face of the country and the territory that furnished scanty support for 500 roaming savages, now, by the blessings of agriculture, furnishes homes for a stable and prosperous population of 50,000, with room enough and capacity enough for 50,000 more.

And here, almost within the sound of my voice, where so short time since was a barren wilderness, annually gather thousands of visitors from every part of our broad land, who, while enjoying the advantage of our health-giving fountains, consume the surplus productions of your farms, your dairies and your gardens, bringing a profitable market to your very doors to stimulate you into more extended agricultural pursuits.

If this whole teeming population should be stricken at once from existence, and no written history should remain to tell the character of this people, how gloriously would those enduring evidences of our

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pursuits and our greatness which exist, contrast with those old ruins and monuments of a forgotten people which exist in the old world.

The traveler stands before the ruins of gigantic temples, before the mysterious sphynx, before pyramids whose massive masonry is almost as eternal as the hills, and they tell him of man's enslavement and degradation. While he gazes in wonder and amazement at their majestic extent, he is impressed with the fact that the labor and toil of thousands was expended in rearing the useless pile for the glory or gratification of some single tyrant, or under the thrall and bondage of a degrading superstition.

But our monuments would tell of a people who leveled mountains and filled up valleys to assist internal commerce, who built through their country a gigantic canal as a highway for trade, the ruins of which would be more remarkable than those of catacomb or temple, and these evidences of useful labor would prove and do prove the grand strides that have been made in liberty and comfort, and universal intelligence.

Labor is no longer a drudge to build up a mausoleum for a single selfish king, but it is the willing assistant to advance the comfort and happiness of the many. It seeks results which shall increase the property of the individual and thus strengthen the State, and no labor is so well calculated to produce this result as the labor of the husbandman.

The arts and the sciences have been made tributary to the success of the farmer. Improved machinery has rendered his labors less arduous. Chemistry has revealed the constituents of his soils and his grains, and thus shown the peculiar adaptation of the one to the other. Long series of careful experiments have improved the quality and productiveness of vegetables and grains, have pointed out their diseases and enemies, and suggested how to meet and overcome them, thus rendering the vocation of the intelligent farmer more interesting than any other pursuit. After all the advantages which science and experience can bestow, success awaits only him who faithfully and thoroughly attends to every duty; for our old mother earth, though bountiful and generous to the diligent is the most uncompromising enemy of the sluggard.

You cannot cajole her out of her good gifts. The artful sophist may sometimes

> "Make the worse appear
> The better reason, to perplex and dash
> Maturest counsels."

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But such arts are thrown away on sharp sighted nature. If you would plant you must take advantage of the spring time. If you would gather good crops you must give them good cultivation. Pretending won't answer. The plow must really and truly turn up the soil, the hoe must actually strike into the roots of the weeds, and this absolute necessity on the part of the husbandman to fulfill and perform the obligations of duty tends to instill into him the virtues of honesty and faithfulness. It is this that makes the "honest yeoman" an absolute verity, and not the mere claptrap appellation of the politician. It is by virtues thus learned that the stability of the State is upheld and strengthened notwithstanding the floods of vice that well up in large cities and swell and beat against its prosperity.

The great problem in the intelligent prosecution of agriculture, like every other pursuit, is to diminish the cost of production by increasing the aggregate returns. Thus the farmer, who finds that five dollars per acre expended for manure, will increase the value of his crops ten dollars per acre, diminishes his labor in proportion to his returns by obtaining the same results from working one acre that would otherwise require him to plow and to cultivate much more.

It is to accomplish this object that labor saving machinery, which will do the work of two men with half the expense that two could do it without machinery, is eagerly sought and adopted.

So, too, in the selection of the particular crop. For instance, the potato that will yield the largest number of bushels per acre, other things being equal, or that will bring the highest price per bushel in the market, is the one that the sagacious farmer will decide to plant.

Extra expenditures, too, in the way of permanent improvements are incurred, if the farmer believes they will pay in the long run. Fields are carefully cleared of stumps and stones, low lands are ditched and underdrained, and the cost per acre of the farm thus largely increased, because experience shows that there will be a large per centage of profit on the capital thus invested.

It has seemed to me, in considering the various sources of the farmer's wealth and income, that there is one subject of interest, which has not received that attention from the farmers of Saratoga county which its importance demands, to which the rules which I have just stated as governing the intelligent action of thrifty farmers have not been fairly applied, and in which there is, it seems to me, an opportunity for a very profitable improvement.

I propose, therefore, very briefly to call your attention to the neat cattle of this county, a branch of agricultural interest in which your

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capital is largely invested, and in which every one is more or less interested. Milk, butter and cheese are articles of daily consumption by us all; and if by careful attention their production can be increased and cheapened, the benefit arising therefrom will be universal.

Fully to understand the extent of this subject, let me call your attention to some few statistics taken from the census returns of 1860 and 1865. In 1860 there were in this county 32,023 neat cattle divided as follows:

Milch cows	16,035
Oxen	2,522
All others	13,466

While five years later, in 1865, we had only 23,471 neat cattle, consisting of

Milch cows	14,583
Oxen	1,182
All others	7,706

So it seems that during the five years from 1860 to 1865 our neat cattle actually decreased in number 8,552; our milch cows decreasing in that time, 1,452.

I presume that since 1865 the number of our cattle has been on the increase, and we probably have now about 30,000 cattle, of which about one-half, or 15,000 are milch cows.

Now these cattle represent a capital of not far from a million and a quarter of dollars, costing to maintain them not far from $600,000, and returning to the owners, in milk and increase, probably about a million of dollars per annum.

This branch of our agricultural interests is, therefore, of sufficient value and importance to repay some considerable effort for its improvement, and that it can be greatly improved in quality, productiveness and value, is evident to any person who has observed the wretched character of some of our stock, the careless manner in which it is neglected, and the marked indifference paid to its improvement.

Our county, taken as a whole, does not possess that mild climate and succulent growth of grasses, which renders stock raising so easy in the south-west. Breeding cattle for beef cannot perhaps be rendered so profitable as raising stock for dairy purposes, and I shall therefore confine myself simply to a consideration of what may be done in the improvement of dairy stock.

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We all of us like to own a good cow, and when we are in want of one we search around until we think we find what we have sought; but how often are we undeceived as to our prize when the milk is tested by that uncompromising truth-teller the steelyards. We know that there is a difference in the quantity and quality of milk given by different cows, but I am inclined to believe we do not all realize the the actual intrinsic difference in value there is between different cows.

One cow takes up as much room as another in the stable, requires as much food, care and attention, so that the difference in the quantity of milk between the two cows is clear profit.

Suppose you were looking for a cow and you should find that your neighbor had two to sell, you should find them of about the same age, say four years old, and very much of the same general appearance. To satisfy yourself as to their respective merits, you should stand by and see them milked; and on the trial you should find that one gave a quart more milk than the other at a milking, and this is a very ordinary difference; on inquiring the price your neighbor should tell you that he asked sixty dollars for one and ninety dollars for the other, the chances are that you would be astonished at the difference in price and would say "I'll take the sixty dollar cow, I shall not be such a fool as to pay thirty dollars extra for an extra quart of milk." But if you did you certainly would make a great mistake, for that extra quart of milk night and morning would, in the course of the season, make 600 quarts, worth twenty-five dollars, and amounting, in the seven or eight years in which you might reasonably expect to keep the cow, from $175 to $200. Why, the truth is that for use you might better pay $100 for the one cow than fifty dollars for the other, because for the extra fifty dollars paid you would receive back $150 or $200 clear profit.

This twenty-five dollars per year is the profit to the individual of an extra quart of milk at a milking; but to this county, if the product from each cow could be thus increased, it would be an increase of $375,000 per annum.

I think this is worth striving for, and that by judicious exertions double this advantage can be attained.

The returns of the census do not enable me to state with entire accuracy the annual production of the cows of this county; but estimating from the amount of butter and cheese manufactured, and adding the ordinary estimate for individual consumption, I am satisfied that the cows of this county yield on an average less than 1,400 quarts each per annum.

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To assist me in forming a correct opinion in this matter I have consulted some of the most intelligent farmers of my acquaintance in relation to the average yield of milk.

Mr. John W. Eddy, who has considerable experience in keeping cows for the sale of milk, informs me that he has improved his herd of cows, and that several of them will yield 2,400 quarts per annum.

Mr. Seymour Gilbert says that a good cow will yield 2,000 quarts per annum; many will fall much below this; but when he finds one in his yard that does, he soon gets rid of her.

Mr. Warren H. Waring estimates that the cows kept by those who supply this village with milk yield less than 1,700 quarts each per annum, and my inquiries among many producers lead me to believe that this estimate is none too low.

Now, as an item illustrating the importance of this interest, consider that in this village alone 2,000,000 quarts per annum of milk are consumed, worth at the retail price more than $120,000, to say nothing of the butter and cheese consumed, and to furnish this milk at least 1,200 cows, worth $60,000 or $70,000, are required.

At the risk of being tedious let me give you some statistics of the average production of milk in other places to compare with the results in this county: Mr. Zadock Pratt of Greene county, famous for his dairy farm, containing over sixty cows, kept an accurate account of its production, and reported the average yield of his cows as follows:

In the year	1857	2,544 quarts.
"	1858	2,604 "
"	1859	2,404 "
"	1860	2,100 "
"	1861	2,264 "
"	1862	2,234 "

These were native cows from fourteen months to fourteen years of age; and Mr. Pratt adds that the secret of butter-making is good grass and constant attention, and that the average yield of butter was about one pound to ten quarts of milk.

The average yield of milk at the Utica asylum farm, where a herd of from twenty to thirty cows is kept, is reported as follows:

1858	2,764
1859	2,692
1860	2,267
1861	2,405
1862	2,949

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To arrive at this average the report says: We take the whole number of cows kept, not the average number in milk.

The increase in 1862 was owing to the cows being fed on food cooked by steam.

The London Field, in an article on dairy cows, states that well managed cows should give from 2,000 to 2,400 quarts of milk annually. Yorkshire Short-horns have been known to produce 3,200 quarts, and Ayrshires 2,600 quarts per annum.

Professor Wilson, in his report on the Danish exhibition, says two dairies of Ayrshire cows give the annual milk produced per cow, at 2,600 quarts, and 2,528 quarts respectively.

Mr. Allen, in his excellent work on American cattle, quotes various authorities, showing that Ayrshire cattle, in their native pastures, average from 2,400 to 4,000 quarts of milk per annum.

Professor Law, as quoted in an article on Ayrshire cattle, published in the annual report of the New York State Agricultural Society, for 1857, says: "Healthy cows on good pastures give 3,200 to 3,600 quarts of milk in a year." Aiton says, "2,400 quarts a year may be deemed about the average of this breed;" and the author of British husbandry says, in reference to this yield: "If equaled, we believe it will not be found exceeded by any other breed in the kingdom." Martin says: "The milk of a good Ayrshire cow will afford 250 pounds of butter or 500 pounds of cheese annually." Milburn's estimate is, that cows of this breed will give 2,400 to 3,200 quarts of milk in the course of the year, and as much as 260 pounds of butter. Haxton cites many statistics, from which it appears that in one dairy of thirty cows the average annual yield of milk was 2,528 quarts; that nine and a quarter quarts afforded a pound of butter; amounting to an aggregate of nearly 274 pounds in a year. He adds: "From these data it appears that the milk of the Ayrshire breed of cows is not only abundant in quantity, but rich in those substances which constitute excellence of quality; and when to these qualities is added the small amount of food consumed, the result is so favorable to this breed that few thoroughly acquainted with the subject will refuse to rank the Ayrshire cows among the most valuable for general dairy purposes in the United Kingdom."

Individual instances are given of cows yielding a larger return than this; and I have received from reliable breeders of Ayrshire cattle, accounts of cows that went as high as 5,000 quarts per annum. These, however, are exceptional cases.

Now the point that I desire to make, is that the average annual

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yield of the cows of this county ought to be increased 1,000 quarts per annum, which will increase the profits of our dairies more than half a million of dollars annually. This is a low estimate of what can be accomplished. Mr. Allen, in his work, says: "The average of our milk dairies as they are usually kept, is not over 2,000 quarts a year; of the butter dairies, 150 pounds; of the cheese dairies, 350 pounds per cow. These averages can be increased full-one half in the simple items of selection of cows, more suitable and abundant food, and increased care in their keeping."

How can this be done?

Why, one palpable means is to feed them better; give them better attention; that's the way Mr. Eddy gets 2,400 quarts a year from some of his cows. That is the way Mr. Pratt, and the farmer at the Utica asylum, acomplish similar results. To feed a cow just sufficient to keep her from losing flesh is clear waste. Every atom of extra food increases the profits, and no animal repays good attention so readily as a milch cow.

There is another way. Pay more attention to the selection and breeding of your cattle. If you have cows that exhibit the points of a first class animal, preserve their stock. There certainly must be, in the high price which good cows command, a wide margin of profit. You select the seed you plant with care, because you know that without good seed you cannot expect good crops. In husking time you select the largest, soundest, best developed corn for the seed of your next year's crop, and you understand that like produces like in the animal as well as the vegetable kingdom. When you want to raise a fine colt, you take your favorite mare to some person, who takes a pride in good horses, and has an *Arcola* or a *Black Hawk* or an *Ethan Allen*, and you do not shrink at the cost, because you know that a colt from such stock is worth, the moment he is foaled, much more than common stock. You feed him well and treat him kindly, and you are almost certain to raise a fine horse.

How very few farmers there are that take any such pains with their dairy stock. If there is some scrub of a calf, too ill favored to make a good steer, the chances are that he will be promoted to the position of father of the herd, and used without inquiry as to his parentage or the milking qualities of his dam, merely because his services are cheap, and they are generally as worthless as they are cheap. Under this short sighted policy, we breed an uncertain and inferior stock, and our dairymen chase from town to town in search of the few moderate milkers that such a course produces. I do not

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mean that all farmers do thus, for I know there are a few who seek, with intelligent and profitable efforts, to improve their stock.

There are Short-horns, and Ayrshires, and Devons and Alderneys, and other choice breeds of cattle from which to select; or, if you prefer, there are choice native cattle, from which, in time, our herds can be greatly improved. With better stock, too, will come better care; for men take pride in their best fruits, their best flowers, their best horses and their best cattle; and as the standard of excellence is raised, inferior animals will be found unprofitable and speedily sent to the shambles.

I do not flatter myself, gentlemen, that in these remarks I have presented any new ideas to you. They are facts with the truth of which you are all familiar but perhaps you have not all of you been struck as I have, with their importance. The improvement which I have suggested is one that can be accomplished in a comparatively short space of time. In five or six years you could add as many hundred thousand dollars to the net profits of agriculture in this county in this single department.

But while associations and fairs, like this, are doing an excellent work in stimulating improvements in every branch of agricultural interest, it must not be forgotten there is a higher and nobler duty to perform in improving and elevating the standard of our common humanity.

It is a great mistake to suppose that the farmer requires less intellectual culture and mental discipline than other professions. On the contrary he requires to be a proficient in the natural sciences. In the circle of his duty, he carefully observes the progress of his crops, from the time the seed is deposited in the ground until the ripened fruit and grain is garnered into his barn. Possessed of a thorough knowledge of botany he would watch the curious processes of nature with new interest. As germ and bud expanded, as leaf and flower unfolded, he would study the perfection of those laws that govern the vegetable kingdom; and finding his avocation to be simply to assist nature, his acquaintance with vegetable physiology would be turned to profit in his experience.

When, with an educated eye, he beholds in the handful of earth from his fields the various organic elements that constitute his crops and his grain, the preponderance of one element and the deficiency of another, he will find the science of agricultural chemistry of assistance in enabling him to adapt his crops to his soil, and to restore fertility by a supply of the appropriate elements. When he

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understands the laws of mechanics by which, through capillary vessels, the moisture of the earth is lifted to the tree-tops; when he becomes familiar with the laws of light and solar heat by which the moisture thus elevated in the leaves and spread out to the action of the sun, is in the wonderful laboratory of nature converted into fruit and flower, and ripened grain, he will feel a new love and interest in his profession. The perfect and undeviating laws of nature, the unflagging progress with which she carries on her work, through day and through night, through sunshine and through rain, will set before him such impressive lessons of order and industry as cannot but elevate and improve heart and understanding.

If you would save your sons from the shops and stores of villages, and the offices and lounging places of cities; if you would make them producers rather than drones, give them the blessings and benefits of a higher culture. Do not let them feel that farming is simply drudgery and servile labor. but show them that it is one of the most ennobling and elevating pursuits; they are not simply the swarthy firemen who, down in the depths, feed the fires that drive the engine, but they are the engineers who sit with hands on the throttle valve, and guide and control the progress and prosperity of the State.

The comparative retirement of the farmer offers the grandest opportunity for reflection and thought, for critical observation of the duty and conduct of our rulers, for careful consideration of the theories offered by our public men, and from the quiet and careful meditations of the rural districts come those sober second thoughts which are the antidote to popular excitement and often the salvation of the State.

We hear daily of new evils which are supposed to threaten us as a people. To-day it is the irruption of the Chinese, who are swarming to our shores from the crowded hives of Asia. They have overleaped the barriers which an antiquated superstition built up against their emigration. They have entered the golden gate of the far west, and soon will be surging on in a living tide across the Rocky mountains. Many profess to believe that the 170,000 of these Mongolian pagans now among us are but the precursors of millions that will crowd our mines and public works and every avenue of labor, until by sheer force of numbers they will obtain complete possession of the country, reduce us to heathenism and crush us out as effectually as if the car of Juggernaut had rolled over us.

Other good people find much to disturb them in the great numbers of Catholic emigrants, the founding of Catholic institutions, and the

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servility of politicians to Catholic voters; they look forward with apprehension to our subjugation to the pope and the overslaughing of civil liberty by religious intolerance.

Others, again fear that the vices and crimes of our large cities will spread over the land like moral cancers, sapping the foundations of our virtue, placing the government in the hands of the unscrupulous and profligate, and breaking down every safeguard for our protection.

But I fear none of these things.

The conflict between vice and virtue, between truth and error is eternal, and truth and virtue are sure to win, either by crushing out error or raising the ignorant and the degraded to a higher level.

Let us give to our youth such intellectual culture and training as will enable them to come off victorious in this daily and perpetual warfare. Let the bulwarks of our defense be their virtue and intelligence, and we shall have a sure rock and defense against which the waves of paganism, of superstition and error shall dash in vain; or dashing, shall be broken into mist and spray, leaving the foundations of our civil and religious liberty firm and unshaken in the hearts of an enlightened and intelligent population.

SCHENECTADY.

The annual fair of this association for the year 1869 was held on their fair grounds October 6th, 7th, 8th and 9th.

STATEMENT OF RECEIPTS AND EXPENDITURES.

Balance on hand from last year	$328 89
Amount received from memberships and at gate	1,982 74
Amount received from licenses shows and refreshments	186 65
Amount received from advertisements in premium lists	100 00
Miscellaneous	2 50
Amount received from sale of lumber	277 05
	$2,877 33

For premiums	$683 50
Other expenses	2,193 83
	$2,877 33

E. SCHERMERHORN,
Secretary.

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SCHOHARIE.

The eighth annual fair of the Schoharie County Agricultural Society and the Schoharie Valley Stock Growers' Association came off, as advertised, on the 5th 6th and 7th days of October, 1869, on the grounds of the Stock Growers' Association in the village of Schoharie. The fair, notwithstanding the recent freshet, proved a success in every respect, the number of entries exceeding that of any previous year.

The display of horses and stock was good, and, in pure bred cattle, better than last year. The exhibition of sheep was very good, but not what it ought to be for a county like Schoharie. The show of fruit proves that apples, pears, plums and grapes can be grown here in such profusion and of such quality as to satisfy the taste and demands of any palate. Vegetables were in such numbers, and of such superior quality, as almost to defy competition. There were several very fine samples of hops and broom corn on exhibition, showing that the growers of our county understand the culture almost to perfection; the hop interest in our county has been growing very rapidly for the past few years, adding greatly to the wealth of the county. The ladies' department was much better than that of last year. Specimens of household industry, economy and good taste were to be seen throughout this department, which adds very much to the interest of the society.

On the afternoon of the third day the annual address was delivered by Hon. John D. Van Buren of Albany, N. Y., and was attentively listened to by an intelligent audience; also the Hon. Horace Greeley appeared and delivered an earnest and interesting address upon the practical duties pertaining to agricultural improvements, which was listened to with attention.

Receipts and disbursements the present year (1869) as follows:

Received from admission fees and other sources		$1,088 50
Paid premiums awarded	$455 50	
All other expenses	413 72	
		869 22
Balance on hand		$219 28

Officers for the year 1870: Charles Bouck, Fultonham, President; Isaac C. Van Tuyl, Schoharie, Secretary; Marshal De Noyelles, Schoharie, treasurer.

ISAAC C. VAN TUYL,
Secretary.

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SCHUYLER.

The total receipts of Schuyler County Agricultural Society for the year 1869 were $2,084.25, all of which has been expended in payment of premiums, in the improvements of the grounds, and in payment on the real estate for title.

The annual fair was held at Watkins on the 28th, 29th and 30th days of September, and attended with marked success.

The annual address was delivered by Horace Greeley, and listened to by a very large concourse of attentive admirers. All, particularly our practical farmers of Schuyler, expressed much satisfaction with the subject and its treatment.

The number of entries of cattle, manufactures and produce, nearly doubled those of any previous year. As to the general and special features of the exhibition I send the following statement by the chief editor of the New York Tribune, whose advantages and ability for judging the merits of a county fair are, perhaps, surpassed by none

A MODEL FARMERS' FAIR.

The little county of Schuyler, the latest born of the sixty which compose our State, comprises seven or eight rural townships surrounding the head of Seneca Lake, a lovely sheet of water, mainly fed by submarine springs which keep it cold in summer, and preclude its freezing in winter, so that steamboats ply upon it all seasons, as they do on no other lake in the union. Its banks rise gradually from its shores, some 300, or 400, feet in the course of five or six miles, presenting the noblest panorama of alternating field and forest that our State affords.

The open lake so modifies the severity of winter, that the grape and the peach here attain a luxuriance rare in so high a latitude, rendering fruit growing here signally successful and profitable.

Watkins, the shire town, lying just at the head of the lake, is a large and growing village, wherein the Chemung canal transhipps its coal and other produce to the lake steamboats, receiving thence merchandise in return; while the Northern Pennsylvania railroad (having absorbed the Canandaigua and Elmira), affords frequent and easy transit to the Central on the north, and the Erie on the south. The census of 1880 will give this thriving village over 10,000 inhabitants.

The county fair was held here on Wednesday and Thursday of last week; and the people seem to have resolved, with one mind to make

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it something to be proud of. I was not there soon enough to see the cattle ; but such cart loads of apples, pears, grapes, peaches, quinces, potatoes, tomatoes, turnips, onions, beets, carrots, squashes, pumpkins, corn, butter, cheese, honey, etc., etc., I never before encountered at a county fair. I was assured, by those who had scrutinized both, that the display of fruit was far larger and finer than that made at the recent State fair; and I can well believe it, since I remember few State fairs held elsewhere than at Rochester or Syracuse, whereat it was equaled. I estimate this fair as worth a dollar per acre to all the land in the county, not counting the horse-trots as contributing a single cent. The day (Thursday) came straight from heaven, unmarred by the journey; the attendance was very large, and the enjoyment rational and perfect. Very few farmers spend a day at home so profitably as thousands did or might have done the closing day of that fair.

Watkins has a rare natural attraction in the wooded glen of a mill-stream which here falls some four hundred feet in less than a mile from the higher level on the west to the valley of the lake. This fall is made by a succession of leaps or cascades into pools or basins of varying depth and magnitude, separated by stretches of swift, bright water, and overhung by the dark evergreens which mainly compose the all-embracing forest, which the sun irradiates but few hours per day. After Trenton, we judge this the finest succession of cataracts in our State. Some of the ampitheatres, worn out of the woods by the plunging waters, are grandly spacious; while for considerable distance a path has been hewn between the precipice and the rushing stream with much difficulty.

Farm Crops of 1869.

During the winter of 1868 and 1869, we had an unusual quantity and duration of snow, which fully protected winter wheat and all other fall grain from injury during the winter and spring.

During the spring and first half of summer an unusual quantity of rain fell, and the last half of the season about the usual quantity, with warm fall weather and late frosts.

The winter wheat made an unusual large growth of straw and the berry was plump and fine, making a better yield than had been known in the county for several years, and is estimated to have yielded an average of twenty bushels to the acre in the county.

Much barley is grown in this county, and it is considered a very profitable crop. The yield of 1869 was more than an average, and

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is estimated to have averaged from thirty-three to thirty-five bushels per acre.

The oat crop was very large, straw very heavy and yielded well, making an average of fifty bushels per acre.

The first half of the season was unfavorable for corn, but the last very good and more than repaired the deficiency of the first, and we never harvested a better crop.

Much attention is now given to the culture of fruit, particularly apples, peaches, plums and grapes.

The apple crop last season was about an average. The bulk of the crop is made up of winter varieties, mostly of the King of Tompkins County, Baldwin, Northern Spy, Wagener, Greening, Roxbury Russet, Talman Sweet and Hendrick's Sweet.

The largest portion of the apple crop is marketed at Washington, Baltimore, Philadelphia, and the interior cities and coal towns of Pennsylvania.

The apple crop is the most remunerative compared with other departments of agriculture, when we take into consideration the space occupied and the annual cost of producing the crop.

Peaches produce well near the shores or on the slopes toward the Seneca lake. The fruit buds are seldom injured in winter, as the lake, being free from ice the entire winter, protects the fruit buds, which are sensitive, and liable to be injured by extreme cold weather in other localities.

Large quantities of plums are raised in this county, part of which are shipped south and east, and the remainder dried.

The lake slopes in this county are believed to be the most favorable locality for growing and ripening grapes found in the State.

The theory of the success in grape culture is, that the lake, being open all winter (the only waters of the State that do not freeze over), the wood winters safely, the spring season is consequently early, and the direct and reflective rays of the sun, near the waters or on the slopes toward the lake, insure a high temperature during the growing season; and the facts are, that the early varieties grown here are in market in New York sooner than from any other locality in the State.

The vegetable crop was good in every respect. Specimens of sweet potatoes grown in this county were on exhibition at the county fair, of a size almost incredible.

Potatoes, beets, turnips and carrots produced large crops. In short, the farm crops of Schuyler in 1869, were extraordinarily fine and abundant.

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There are many good dairies established in the county that furnish excellent butter. Also a number of cheese factories in successful working progress in Schuyler, and more attention is being paid to the manufacture of butter and cheese.

The total receipts from all sources, accruing to the society for the past year (1869), was $2,059.25; total expenditures for same year, $2,085.

A. H. MOORE.
Secretary.

SENECA.

At the annual meeting of Seneca County Agricultural Society, held at Ovid on the 20th day of January, 1870, the following were elected as officers for the ensuing year: President, Josiah Rogers, Waterloo; Secretary, William W. Stacey, Fayette; Treasurer, John D. Coe, Romulus.

The following is an account of the receipts and expenditures:

Receipts.

Balance on hand		$109 19
Received from members at fair at $1 each		736 00
for tickets and arrearages		553 99
miscellaneous receipts		246 39
from State		180 37
		$1,825 94

Expenditures.

Paid at winter meeting	$54 00	
premiums	356 50	
premiums for trotting	195 00	
fair expenses	843 50	
for printing	81 00	
		1,530 00
Balance in hands of treasurer		$295 94

The annual fair in October, notwithstanding the weather and other disadvantages, gave almost universal satisfaction, and was a decided success over former years, the receipts being much larger; and the display of animals, farm and garden products, fruits, grain, vegetables, mechanical and agricultural implements, was very fine. The address was delivered by Hon. Horace Greeley, and the reputation of the speaker called out a large crowd.

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The crops of the county for the past year were good, the improvements in agricultural implements no doubt adding largely to the success in this direction.

SILAS KINNE,
Secretary.

STEUBEN.

I herewith transmit to you the annual report of the Steuben County Agricultural Society for the year just closing; and in so doing I am able to speak in the most flattering terms of the condition of our society, evinced by the large number of its members, the interest taken in its meetings by both officers and members, and the great success which for the past four years has attended its annual fairs, and other exhibitions. It seems as though our farmers and mechanics have at last realized the benefits which can be derived from lending their hearty support to their county agricultural society. Aside from the distribution of seeds, and books and reports furnished us by the department of agriculture and the valuable transactions of the State society and the American Institute, and other documents kindly furnished us, the work of our society, for the past year, has been directed toward the carrying out of its seventeenth annual exhibition which was held on the society grounds at Bath on Wednesday, Thursday and Friday, the 6th, 7th, and 8th of October last. It was with a feeling of great anxiety for its success, that our officers determined to hold a fair this year. The fair of your society at Elmira in an adjoining county, it was felt, must necessarily attract greatly both those of our farmers and other working classes, who support such exhibitions and thus tend to detract from the interest which they would otherwise show in their own fair. But the result proved that our fears were not well founded. Never before since our organization have our grounds been so thronged with exhibitors and visitors as at our last fair. The weather during the three days was all that could have been asked. The number of entries was 1,120, exceeding by nearly 400 the number last year. Among the entries were many from the adjoining counties of Yates, Chemung, Tioga, Livingston and Allegany, and from Pennsylvania, the receipts ($2,102.75) exceeding by nearly $100 those of any previous fair. The exhibition of cattle, Short-horns, Devons, natives and grades, was large and fine; among the blooded Short-horns were two fine bulls, the "Duke of Waterloo," owned and exhibited by J. L. & S. S.

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Smith of Bath, and "General Grant," 5673, A. H. B., owned by S. H. Haskin of Avoca, to both of which were awarded premiums. There were many fine animals from the herds of McElwee & Robie of Savona, R. B. Wilkes of Bath, S. H. Haskin of Avoca, J. L. Smith of Bath, Daniel B. Curtis of Campbell, and other well known breeders of our county. Of sheep of all grades the exhibition was large and well selected. From the choice flocks of C. D. Champlin of Urbana, J. Richardson of Bath, and others, were many fine wooled, while Messrs. A. C. & M. Brundage from their large flock of Cotswolds presented many fine animals. Of middle-wooled and fat sheep there was also a good show. Of swine and poultry there were a goodly number of entries. Of horses, mares and colts there was a good exhibition, brought out to a great degree by the very liberal premiums offered in these classes.

Of carriages, wagons, etc., the display was most excellent. But to the crowd, the exhibition of fruits, grain, vegetables, flowers, fancy needle-work, embroidery, canned fruits, domestic wines, millinery, musical instruments, sewing machines, hardware, stoves, harness and countless curiosities, with which agricultural hall was literally jammed, constituted the center of interest.

In the east gallery were very tastefully arranged a large, and valuable collection of stuffed birds, eggs, insects, fishes, etc., and a rare and beautiful collection of ocean shells and corals, which attracted much attention. The west gallery was set apart, for the exhibition of grain and vegetables, and in this department the display was finer than we have ever had; a display which we think the society may well feel proud of. Among the entries worthy of especial notice, were one hundred varieties of potatoes grown and exhibited by General O. F. Marshall, of Wheeler. The other departments of the exhibition, are equally entitled to mention, but it is not proper or possible for me to particularize. The annual address was delivered on the afternoon of the third day by D. D. T. Moore, Esq., the editor of the Rural New Yorker, and was listened to by one of the largest audiences that ever assembled in the county. Mr. Moore, chose as his subject "The Coming Farmer" whom he delineated as the model American citizen of the next century. To our farmers it was particularly instructive and interesting, and was most attentively listened to throughout.

With the "Annual Reunion and Fair Dance," given by the society, on the evening of the third day, in agricultural hall, which was attended by a large and select company the seventeenth annual

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exhibition of our society closed. In every respect it was a gratifying success to its friends, its members and its officers, and we cannot but think that it will be fruitful in good results.

I have found it impossible to collect such data as would enable me to present to you a full statement of the amounts of the various crops and produce grown in the county during the year now closing. The season was so backward in the spring, particularly upon our hills, that our farmers found it very difficult to put in their spring grains in time, and that embarassment, together with the continued wet and cold weather, retarded the growth of all crops, so that the yield was not up to the average of years. Our corn crop, except in our river valleys, was almost a failure. The growth of clover and timothy was large. Barley above the average, with a great breadth of land sown; average yield about thirty bushels per acre. Winter wheat a moderate yield; average in the valleys from fourteen to sixteen bushels per acre. Of spring wheat, which is mostly grown upon our uplands, the yield was poor. Oats as a general thing, a fine crop, with an average of thirty-five bushels to the acre. Buckwheat a medium crop. Potatoes very light and damaged by early frosts and rot.

The following are the officers elected at the annual meeting for the ensuing year:

President, Charles H. Robie, Savona; Secretary, Reuben E. Robie, Bath; Treasurer, George W. Hallock, Bath.

The following is a list of the receipts and expenditures of the society for the year ending December 31, 1869.

RECEIPTS.

Cash in treasury at date of last report	$50 84
from annual membership tickets sold	727 00
gate fees at fair	1,080 25
miscellaneous receipts and donations	659 50
annual appropriation from State	353 44
Total receipts to December 29th, 1869	$2,871 03

EXPENDITURES.

Paid debts and interest	$1,075 11
expenses of fair	768 82
premiums at fair to date	844 25
Cash on hand at date December 29th, 1869	182 85
	$2,871 03

R. E. ROBIE, *Secretary.*

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SUFFOLK.

The annual fair of the Suffolk County Agricultural Society for 1869, took place at the fair grounds at Riverhead, Wednesday, Thursday and Friday, October 6th, 7th and 8th. The exhibition hall was completed in season. The weather was unusally fine.

There was a meeting of the society on Wednesday evening, at the court-house, when a very pleasing and able paper was read by Mr. Robert W. Pearsall, of Brentwood, which was followed by another of much interest and instruction, upon "Fertilizers and their Application," by the Hon. Henry P. Hedges, of Bridgehampton. Mr. William Nicoll, then in a few appropriate remarks addressed the society, calling attention to the exhibition hall, now opened for the first time, spoke of its commodiousness and symmetry; and, with a view of liquidating the debt incurred by its erection, he moved that a committee be appointed for soliciting persons to become life members of the society, upon the payment of ten dollars each. The motion having been passed and the committee appointed, Mr. Nicoll manifested his earnestness in the movement thus inaugurated, by presenting the society with seventy dollars, for the purpose of making his wife and children life members. Others immediately followed the examples, so that at the adjournment of the meeting about $400 had been contributed.

The annual business meeting of the society, was held at the court-house on Thursday evening, October 7th, B. D. Carpenter in the chair.

The election of officers was then held resulting as follows:

President, B. D. Carpenter, Cutchogue; Vice-President, Henry G. Scudder, Huntington; Secretary, Thomas S. Mount, Stony Brook; Treasurer, Joshua L. Wells, Riverhead.

The society was then highly entertained by a well prepared and able address, by the Hon. Wm. Nicoll, of Islip, in which the agricultural interests of the county were practically and systematically considered. It was then

Resolved, that a vote of thanks be tendered to Mr. Nicoll, for his excellent address, and that a copy be requested for publication.

The building erected upon the fair grounds, is in the shape of a Greek cross, 100 feet long and forty feet wide at each arm of the cross. It is two stories in height, with a gallery encircling the building, communicating with the main floor by eight spiral stairways. It

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has four entrances, two piazzas, and two balconies, and stained windows. The cost of erection was $5,000.

The wheat crop has been very good; better than usual, though not the very best. Corn about three-fourths the usual yield; some fields the same as usual; many very good, and some almost a failure. This has been due to local causes. Buckwheat was badly injured by the drought; yield from eight to ten bushels to the acre. Potatoes: Yield large, and very fine in size, but troubled with rot. Turnips nearly cut off except when planted early, and then the yield has been good. The oat crop has been unusually good. Rye and barley I don't know much about. The present growing winter wheat is looking well

THOS. S. MOUNT,
Secretary.

TIOGA.

The present officers of our county society found the books in arrears, the treasury empty, and the society in a bad way generally, which had arisen from some indifference on the part of our farmers in the county, as we have abundant material in our county for one of the best agricultural societies in the State, and as the society has been in existence for fourteen years, and always maintained a fair and cattle show each year (as the improvement in our stock will show). The present low state of our society is such, that it is hard to get up to a good working point again.

The society did not hold an annual fair and cattle show last year, consequently, nothing was done to replenish our exhausted treasury, and we are now laboring under an indebtedness that cannot be overcome without volunteer aid, which might be had by the asking.

In assuming the position of treasurer again, after four or five years in the hands of another, I find my time so much taken up to the present time, that I have been unable to devote the necessary time to maintain a good and flourishing society.

We did not ask for the amount due us from the State Treasurer last year, on account of our not holding a fair and cattle show.

If I can find time to take hold of the offices of our society during the coming summer months, I have no doubt, I can report to you a very favorable result in the fall.

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Present officers are: President, George Smith, Owego; Secretary, Wm. Smyth, Owego; Treasurer, T. I. Chatfield, Owego.

T. I. CHATFIELD,
Treasurer.

TOMPKINS.

The Tompkins County Agricultural and Horticultural Society held their thirtieth annual fair on the society's grounds at Ithaca, on the 14th and 15th of October. For many reasons this was very late in the season to hold a fair, but it was unavoidable, as the first time appointed conflicted with the State fair, and had to be postponed and could not be held before without interfering with other fairs in adjacent towns and counties.

The fair was not a decided success pecuniarily, but the exhibition was one that the society may well feel proud of. It was remarked by very many, that the show of stock was the best in most respects that had ever been held in the county.

There was over eighty head of cattle entered for premium's besides the celebrated herd of Short-horns exhibited by Hon. E. Cornell, but not entered for premiums.

The show of sheep was also fine, the long and middle wools taking the lead, as we noticed a great falling off in the fine wools shown in comparison to former years. The show of swine was good, but not as large as on former occasions.

The show of horses was unusually fine, sixty-one horses and colts being entered for premiums, most of them very fine animals.

The department of agricultural implements was very well represented, being by far the largest and finest ever shown in this section.

The show in the hall was large and in many departments very fine, especially of fruits and vegetables.

Taken on the whole the fair was one of the best ever held in the county, but the attendance was small on account of the lateness of the season, and also the unfavorable weather. The secretary is of the opinion that it would be a benefit to the managers of county societys if the State society would set the time for holding their fairs at their annual meeting, thereby enabling county societies to appoint theirs sooner.

EDGAR BREWER,
Secretary pro tem.

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ULSTER.

There has been received during the year from members, including sales of tickets at the gates for admission to the annual fair, the sum of	$1,020 18
For stock sold	30 00
From the State	333 94
	$1,384 12

Payments.

Premiums	$661 00
Attendance of officers at fair, printing, etc	360 00
Interest on mortgage debt	56 00
	$1,077 00

Indebtedness.

Mortgage debt	$800 00
Due treasurer (advances)	243 00
Indebtedness as per last report	1,153 24

The annual fair was held on the 22d, 23d and 24th days of September, 1869. The society was addressed by the Governor of the State, Hon. John T. Hoffman. We attach a printed copy to this report, and commend it as one of the most valuable and instructive addresses that has come under our attention. It met the hearty and we believe universal approbation of the large audience to which it was delivered.

This has been what may fairly be called a productive year. Wheat, oats, potatoes and corn crops have been productive about in the order named, on the whole somewhat above an average. Rye failed last year and more this year, demonstrating to our judgment the fact, that it has become from some cause a worn out crop, and should not be sown in large quantities in this section for a time. The heads the last year were frequently filled with but three or four grains, and few are fully filled. Like the wheat crop some ten years ago, an insect or a blight affects the crop brought forward even under the best auspices. Wheat, on the other hand, is now doing well here, and on good soil has yielded so well, that we have given it the first place in yield for the year.

In fruits, pears have yielded an unusually large crop of very fine varieties. Apples are considerably short of the average. Strawberries and grapes have done well, of the small fruits, while raspberries and blackberries have done badly. Whortleberries, of which the

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county produces usually a large quantity for market, grown naturally on the mountains, have this year yielded an inconsiderable crop.

Address of Hon. John T. Hoffman, before the Ulster County Agricultural Society.

The heat of the summer is over. The beautiful green which in May and June covered field and forest, has faded out in the blazing light of the July and August sun, and soon every mountain and valley, hillside and plain, will be decked in the varied and gorgeous colors of our American autumn. The harvests are gathered. The granaries and barns are filled to overflowing. All over the broad meadows the haystacks are standing, giving forth a rich fragrance, and ready to serve as a shelter to the cattle against the coming winter winds, and as food when the pasture lots are buried beneath the snows. The scythe and the cradle have been laid aside for the flail and the winnow. The orchards, groaning beneath their burdens of fruit, will soon be relieved of the rich and precious weight under which the branches of their trees now bend. The apples will be crowded into the cellar and the cider press to furnish food and drink at the social gatherings in the long evenings by the winter fireside. The chestnuts are ripening in the burrs and, with the coming of the early frosts, the woods will resound with the glad voices of boys and girls as they beat the trees to make them give up their treasures. The hickories in the forest, types of firmness, strength and beauty, will soon let fall their rich and luscious nuts to be cracked with many a joke when the young folk gather in the coming winter nights. It is the period of fruition. The promise of the seed-time is abundantly fulfilled in the wealth of the harvest. The farmers, ready for a brief holiday, crowd to the county fairs, bringing with them the best products of their farms, trophies of labor and skill; they come striving in friendly but earnest rivalry for the prizes offered to excellence. Their wives and daughters dressed in their best attire, join with them in the festival, and bring samples of their handiwork and evidences of their industry and taste, claiming, as they have a right to claim, a share in the honors as well as in the pleasures of the day. The fat cattle in the stalls and the fast horses on the track seem to partake of the pride and satisfaction of their owners, and of the spirit of emulation which moves them. The young men, full of energy and faith, with faces bronzed by the summer sun, and hands hardened by the summer toil, greet one another with a pleasant smile and hearty word; a smile and a word which betokens the good-fellowship existing among them

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The country is at peace. The strife among brethren is ended. The great armies which carried with them everywhere death and desolation, inseparable alike from conquest and defeat, have long since been disbanded and the sheaves of peace are garnered as the fruit of victory. The earthworks, from behind which for so many long years man sent forth the messenger of death to slay his brother, are rapidly disappearing as the rain from heaven falls upon them; and the evil passions in the hearts of men, born in prejudice and fostered in the hatred engendered by civil war, they, too, are passing away under the better influences of love and mercy; attributes which have their birth in heaven and which, like the falling rains and gentle dews, invigorate, cleanse and purify. All over the thousand battle-fields, once plowed by shot and shell, the husbandman has been laboring; and the harvest of death, upon which the God of battles frowned, has yielded to the richer and nobler and more glorious harvest of fruits and grains upon which the God of peace has smiled. Better thoughts, higher resolves, more generous impulses have sprung up in the soil of men's hearts even as the flowers have grown upon the graves of the buried soldiers; but not, let us hope, like flowers to bloom awhile and then to fade and perish. Bitterness and passion begin to yield before true manhood and magnanimity, and we feel now that we have the power and the will to lift off from the shoulders of the people the burdens which rest upon them and to move forward with steady steps into the hopeful coming years of our country's life.

With mingled memories, sacred and pleasant, filling the past; with peace, plenty and prosperity around us and the promise of a bright future before us, we ought to be, and I trust we are, devoutly grateful to God for all his goodness.

We have assembled to day, my friends, under auspices of the Ulster County Agricultural Society. The influences of societies like this upon the farmers and upon the great agricultural interests of the State and country can hardly be overestimated. They encourage everywhere a laudable spirit of ambition and rivalry. They furnish opportunities and occasions for the exhibition and comparison of the best products of the soil and of the implements which the inventive genius of man has devised to lighten the burdens of labor and to increase the facilities of realizing rich and abundant harvests. They disseminate much valuable information and create in the minds of old and young alike a desire and thirst for more. They bring together men of all creeds in religion and all shades of political faith, for the exchange of thought and suggestion upon the one subject in

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which they have a common interest, "the agriculture of the land." Here, at least for the time being, all differences of opinion upon other points can be laid aside and men can act together with a common purpose and for the common good.

It is not expected, I trust, that I shall deliver to you an address upon practical agriculture. To speak frankly, as I like to do, I know nothing of it. I have spent much time among books and but little in the fields. I know something about the drainage of the pockets of tax-payers, little about the drainage of lands; something about political combinations, little about chemical composts; something about sowing seeds of dissension among opponents, little about those better seeds which, when well sown, ripen into a blessed harvest of grains and fruits; something about the machinery of politics, little about those great agricultural machines which have done so much to lighten labor and develop soil. The fields you work are to me unknown lands. I am sorry for it, but the lines of my life have been cast in other places, and I freely confess my ignorance.

My experience as a farmer, was very limited and may be briefly told. Once, when in early life health seemed failing, a learned doctor advised me to leave my books, go upon a farm and follow the plow. It was much easier to follow his advice to go upon a farm than to follow the plow after getting there. I tried it, however. It was in my own native and beautiful county of Westchester, close upon the banks of the glorious Hudson which washes your shores as it does her's; the river of our admiration and love, upon whose bosom our eyes rested and our boats floated when we were boys, and near to which we shall most of us find, as we would wish to do, our final resting place. My agricultural labor continued for half an hour. Having put my hand to the plow I did not look nor turn back, but pushed forward to the shade of the nearest tree and rested quite content. What grew in the furrows plowed that day I never knew or cared to ask. Satisfied that my doctor would never have taken his own prescription if his physical power was as much wasted as mine was, I converted the plowshare into a fishing rod, changed my physician and regained my health.

With this limited experience in agriculture I come, farmers of Ulster, to address you; not in a formal or studied speech nor with any show of learning, but with a few plain, and I trust, timely suggestions.

There is no class of men in our whole land more influential and powerful than the farmers. Ours is essentially an agricultural country, with every variety of soil and climate; and the men who till

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that soil, causing it to bring forth the wealth which makes the nation rich and the people prosperous, are a power in the land whose influence for good or evil, must be and will be felt throughout its borders. Being so, it becomes you, like men, to learn how that influence and power can be best exercised for your own good and the good of your fellow-men.

Laborious though it may be, there is no work more noble than that performed by the enlightened and educated farmer, who, with well-trained mind and industrious hand, draws from the vast and inexhaustible fields which lie around him, the abundant treasures of nature. I say the educated and enlightened farmer; he, who in all that makes a farmer and a man, is as far above the clod-hoppers of other lands, as is a thorough-bred above a cart-horse. Education does not lift a man above labor; it lifts up labor to the man. Honest labor, even though performed in ignorance, is respectable always, and nowhere so much so as in this country. Yet mere human drudgery, handwork and brain idleness, differs but little from the work done by the machines which cannot think, or the beast of burden which can only feel. When, however, intellect and muscle work together; when the heart throbs and the brain plans and the hand toils, then, indeed, is there a long pull and a strong pull and a pull altogether; and the farmer, clothed in all the attributes of manhood, is lifted to the full dignity of his high calling. Then labor becomes a blessing, not a curse. I think one of the good effects of your agricultural societies is, to make you partially realize and appreciate this truth. I do not believe, however, it is yet half understood; for, outside of a limited circle and area, progress has not been rapid and marked. There has, nevertheless, been some change for the better. The time was, and not long ago, when the farmer would cling with blind prejudice, to all the imperfections of the past, as if progress were the natural enemy to prosperity. He looked with mingled feelings of pity and contempt upon his energetic, but as he thought, visionary neighbor, who was willing to avail himself of all the discoveries of science, and the improvements devised by inventive genius. New-fangled notions, as he called them, did no good to the farm or its owner. His ancestors were wise enough for him. He did not care to know any more than his grandfather did; and so he plodded on, sowing his seed, which by God's blessing would grow, and reaping in due time scanty harvests, which he fondly believed could not be improved. He cared nothing for books. He would not read essays or journals devoted to agriculture. He denied to his children all opportunities to acquire know-

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ledge, save those afforded during a brief winter season, in a miserable school-house, where some half-paid teacher who "boarded round," would teach the boys to read, write and cipher, and he begrudged the paltry tax which he had to pay for that.

But a new light has dawned upon the farmer of America, the light of a larger knowledge and of a sounder sense. The examples set by a few intelligent, enterprising men of your profession are followed by hundreds and thousands all over, and the farmers begin to feel that they are not only the laboring but the thinking men of the land.

Every man has his use, and a lesson may be learned from almost any incident of every-day life. I have heard too often the hard-working farmer, who rose at the break of day and worked with his own hands till the sun went down, laugh at the "gentleman farmer," as he called him, who did no hard work and spent his money, as was said, like a fool, in trying new inventions and making new experiments. But a man may learn even from fools, especially such wise fools as some of these gentlemen farmers. I once heard of one who had a beautiful place not many miles from here. His broad acres lay all around him in lawn and meadow or in rich fields of grain. His barns were costly and beautiful. His home was not the plain farm-house, but the elegant mansion, filled with all that money could buy, books and pictures and statuary. His library was stored with works full of agricultural learning. He had the finest breed of cattle and horses, and every improvement in agricultural machinery could be found upon his land. He had a passion for farming, and did not despise anything because it was new. It is true he found his work pretty expensive, and his accounts did not always show a balance on the right side. Once when visited by some friends, after showing them all the beauties of his place, he said quietly, "Now let me offer you some refreshments; will you take champagne or milk? I have both, and they have cost me about the same per quart." It was doubtless true. The farm brought to him no pecuniary profit, but he had his enjoyment, and it served his purpose. He showed to practical and prudent men around him who looked upon his fine fields and his blooded stock, his improvements in drainage, in making composts and in using manures, his well-built barns and his agricultural implements, that, imitating him in what was wise and avoiding what was useless and extravagant, they could have all that was valuable if they would only make the effort; on a smaller scale, indeed, but in abundance, and using the means he used as prudent working farmers know

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how to do, they could realize from them not only the pleasure of the possession, but the pecuniary profit as well.

The practical idea which I wish to impress upon your minds is that you should, as farmers, with great responsibilities resting on you, neglect no opportunity of acquiring information, and avail yourselves, as far as possible, of every instrument and means of progress and improvement which offers.

Every farmer's house should contain a small collection of well selected books, books to be read, not merely looked at. An agricultural and scientific journal should be in every farmer's hands. You have no right to shut your eyes to the progress of the age in which you live, and to the discoveries of modern science. You have no right to remain in ignorance of the great changes going on all around you, so long as opportunities for learning about them are within the reach of every one of you. You have no right to limit your reading to the market report which tells you of the price of wheat and rye, of apples and potatoes. God made you intelligent men, with the power to reason and to learn; and in this great land of ours where you farmers can, as I have said, exercise so much influence for good or evil, you have no right to let your powers lie dormant, and be content with standing still while men all around you are marching on with the great army of intelligence and progress.

I do not underestimate the great advances which the farming interests of the country generally have made, but this idea of educated labor has not taken hold of their minds and hearts as it should do. Why is it that through the farming districts of many portions of our State and country the building which appears to be the most neglected and the least respected is the district school-house? How often do you see it, standing by the roadside where land is the poorest and the cheapest—a single story frame building. The hinges on the door are broken. The cheap red paint which once covered its sides is washed away by the storms of many years. Its small windows are shattered; its timbers are rotten; no grass grows around it; no shade protects it from the noon-day sun. Its furniture is poor and shabby. It is the meanest thing in the neighborhood except the spirit which allows it to remain neglected.

There is no cheer within it, and I fear too often little good comes from it. It looks less respectable than the shelter provided for the cattle on the farm, and the boys and girls who gather within it seem to be less cared for than the beast that perisheth.

The poor schoolmaster, living on starvation wages, cannot expect

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to do much for the education of children whose parents care so little as to what they learn, or from whom they learn it; and the children feel, as they ought to feel, that a place which has so few attractions is no place for them.

These things may not be so in the county of Ulster; but they are so too often elsewhere. The farmers of America have a solemn duty to discharge, to their children, to their own consciences, and their country. Let them see to it that the school-houses everywhere shall be cared for and protected; that the teachers shall be encouraged and sustained; that the district libraries shall be kept up and increased. They must remember that the education of their children is not attained when they can read and write and cipher through the rule of three. Let them not forget that the world of thought has moved forward since they were boys, and that even if they are too old to catch up, their children must not lag behind in the race.

The farmers in America are far in advance of the farmers of Europe in the comforts of home and fireside. There the great landed proprietors enjoy the comforts and luxuries of life, but the smaller tenants and the laborers who work the land have few of either.

Here the farmer, who generally owns his farm and does not hold as tenant, everywhere has at hand the opportunities to make home attractive. Many, indeed, neglect them. Why should any choose, as some do, the poorest and the lowest lot for the site of the dwelling-house? Why should rank weeds fill the door yard? Why should the front door be closed and the "best room" be shut almost every day against the light of the morning sun and the cheerful blaze of the evening fire? Why should any farmer's shelves be strangers to books, and why should the melody of music not be heard within their walls? These things should not be, but they too often are. Life at the best is short. Let it be made, therefore, as cheerful and pleasant as is consistent with the faithful discharge of its duties.

When you can, oh ye farmers, choose for your dwelling some pleasant site overlooking the surrounding beauties of nature, and let their contemplation inspire you with gratitude to God. Let the rose and the creeping vine and the honeysuckle bloom about your home. Let the light and warmth of the blessed sun drive out of all your rooms the musty damp with which closed doors and windows will taint them. Put upon your shelves a few well selected books; not agricultural alone, but histories, biographies and even good novels, which, while they will amuse your children, will create an interest for other and more instructive reading. Give to your daughters the

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chance to learn some accomplishment, which will relieve the drudgery of daily life, and let the melody of music fill your house. Give to your hired men the comforts of a home, and do not let them feel that they are less cared for than the beasts, whose natural masters they are.

Do any of you say all these things tend to luxury, and idleness, and vanity; that the boys and girls and men will be above their work, and be less fitted for their daily toil? Do you think your farms will be less productive because your homes are made more attractive? I tell you *No.* No man or woman is ever made worse by having home rendered pleasant. The love of home is a holy love. It keeps many men and women pure amid all the temptations of the world, and the wise and thoughtful parent who would see his children happy will study to make their home the most beloved spot on earth.

There is no reason why the farmer's houses and lands should be places for toil and care only. There is no reason why himself or wife and son and daughter should drudge for ever, and have less than others of the joys of life.

On the contrary, God has surrounded you with more sources of joy and of comfort, and of true luxury, than are given to your fellow men. No money can buy what you have always at hand of these things. Sunshine and fresh air, for want of which the dwellers in cities pine, are to you daily gifts. The flavor of new cream, the taste of freshly gathered fruits, no foreign wines or spices can equal them in delicacy. These you alone can fully enjoy; for, be as careful as you may, every mile of transportation to market takes off more and more of their delicate flavors. It seems as if God intended that the choice luxuries of nature should be enjoyed in full perfection only, by those whose hands contribute to their production. It is the tendency of us all to overlook the sources of enjoyment which are every day at hand, and to think that greater pleasures are to be found in enjoyments further from our reach. My advice to farmers, as to other classes of men, is that they cultivate an appreciation of the good things they have at hand, and make the most of these first, before they indulge in longings after the fancied enjoyments to be found elsewhere.

One of the most deplorable evils of the times is the craving desire of the young men of our country, to exchange the freedom and independence of the farm for the exciting, busy, tumultuous, yet slavish life of great cities. The life they lead at home is one of labor, with apparently small rewards. It is thought to be a life of mere

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drudgery and toil from the rising to the setting of the sun, with but little of anything to relieve its weariness and monotony. The young man feels that he is but a laborer on his father's land, having no ownership or interest in it, and no hope of any until that father lies beneath the sod. He hears much said about the independence of the farmer's life, but it is a kind of independence he does not appreciate or understand. He asks himself the question, "In what do I differ from my father's hired servants?" and he finds no satisfactory answer. He looks into the long streets of a great city, lighted as they are by a thousand false lights, and he is attracted by their splendor, for he thinks it real. He hears how lawyers and bankers, and merchants and manufacturers grow great and rich, and how their sons share in their prosperity, and in the luxuries and comforts which it brings. He is told how the man of business, professional and mercantile, educates and trains his children, and how, when they come to man's estate, they are made partners or are given an interest in the profits which they help to make. He says, "Upon my father's farm I have no interest, nor can I have until he is dead." He hears of the great and wonderful riches which men sometimes accumulate so rapidly in the channels of trade. And as he watches the slow course of the seasons, and the gradual ripening of the harvests, and the uncertain progress his father makes, in despite of all his labor, in getting rich, he envies the man of the town, of whose dangers and anxieties, sorrows and risks, difficulties and failures he hears but little; and he longs to throw off, what he considers the slavish dependency of the farm life and exchange it for the freedom of the city. There is just enough of real substance in his complaints to justify his discontent, and just enough glare in the prospect which invites him, to dazzle his eyes.

This desire for change cannot be eradicated, but it can be lessened somewhat. I ask you, ye old men, are you not somewhat to blame? Have you not forgotten the passions and ambitions and sentiments of youth? and having forgotten them, are you not inclined to say that, "what is good enough for the old man should satisfy the boys?"

If any of you has a worthy son, who has toiled for years and been faithful to you, yet who longs for this change from country to city life, are you not a little in fault? Suppose you do as the lawyer or banker, or merchant does, make your son your partner in business, give him an interest in the profit of the farm. Let him feel that he is the owner of land. Those who work other people's lands, either as laborers or tenants, never can feel the spirit, the ambition and the energy which dwell in the breasts of the owners of the soil. You

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who think that you can make the young men of America, high spirited as they are, satisfied, even though they be your sons, by keeping them on your farms, in any dependent position, are mistaken. They must be made to realize that fidelity in your service will earn its just reward, as like fidelity does in other stations. When you have done them justice, you may hope to find them contented.

But while I speak thus to the fathers, I wish the young men also to listen. You desire to change your country life for a life in the city. Think well before you act. The road before you is not so smooth and pleasant as it looks. Some seek clerkships in public offices. To those I say, in words of earnest warning: never surrender the comforts of your home, and the certain independence of your vocation, for the petty salary you can earn in an official station. The man who is dependent on official salary for support, becomes the slave of party. He holds his place by an uncertain tenure. He has hardly a chance for advancement. He dwarfs his intellect; too often belittles his manhood, and becomes the most dependent of all dependents; and when, in the course of time, changes come, he finds himself without occupation and without means. He is thrown upon the road without a trade or a profession. His place upon the farm is supplied by others, or if it be not, he can no longer labor, for he has become unused to toil. He is but little better than a beggar, for he has not the means to live, or an occupation which can procure for him subsistence.

To those who would give up the farmer's life, for the uncertainties of trade in great cities, let me say: you should carefully calculate the chances of success before you act. If you have a talent for trade and no taste for your country life, then take your chances amid the great struggling multitude. But recollect that in mercantile pursuits, where one man succeeds, many fail. The great ocean of trade and commerce is filled with wrecks. A few only of those who embark upon it reach the haven where they would be; and to the innumerable hosts who sink in its turbulent waters, but little aid is tendered, and but little sympathy extended. You who from your country home look upon this great mercantile ocean, see none of the many who have been engulphed within it. Rejoice that you are free from the perils to which they were exposed. None who own and till the soil fail to win, if they labor industriously to achieve it, an independent livelihood and an honorable success.

The crops may sometimes fail; the land may be parched; blight and disease may attack your cattle and your flocks, but for one season

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of misfortune there will be many of abundance and prosperity. The providence of God may send you sometimes temporary disaster, but you can hardly be utterly ruined, as the merchant can, by the folly or the treachery of man. Envy not the smartly-dressed clerk, nor even his rich employer, surrounded by the splendors of city life; the brightness of the outside wrappings is not always a guaranty that there are cheerfulness and peace of mind within. Many of these men may more justly envy you your sound sleep, of which their over-anxious and over-wrought brains so frequently defraud them.

The life and condition of the farmer are not what they were a century ago.

Everything has tended to lighten his burdens and to add to his comfort, his independence and his power. While he has been plowing and reaping, the inventive genius of man has been at work to lighten the labor of his hands. To recount the inventions of the last twenty-five years, would be to tell the story of amazing progress. But I shall not undertake the task to-day Time forbids.

Within the past year alone, more than 2,000 applications for new patents have been filed in the department at Washington, and more than 1,500 patents have been issued for new agricultural implements, or for valuable improvements upon old ones. The false idea that labor-saving machines were the manufactured enemies of the laboring men of a country, has been exploded. All the inventions of the age in which we live have not diminished the demand for farm laborers in America. The cry is still for more, and from the lands across the sea hardy men are coming to supply the demand and to meet the want. Mind and muscle thus work together to develop our vast extent of territory, and to make us the greatest producing country of the world.

Home and foreign markets are of easy access. At home, the great lines of railroad and water communication give to the most distant sections advantages, which, a few years ago, were hardly dreamed of. Upon lakes and canals the rich and abundant harvests are borne on to the great central markets, and competing railways, with reduced charges for freights, bring to the same markets their great loads of the produce of the far west.

Almost before the din and bustle of the late civil conflict were over, the Pacific and Atlantic oceans were linked together by the Pacific railway, pushed forward to completion, as it was, by an energy almost unparalleled, and passengers and freight are now hurried across the continent in less time than was required some years ago to trans-

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port men (some of whom are now living) from Albany to New York.

The nations of Europe also offer to us their markets. The sailing vessels upon the ocean, struggling against adverse winds, have, to a great extent, given place to the advancing power of steam, and cargoes of wheat and other grain rapidly find their way across the seas. As the great emigration of Europe diminishes her productive powers, and increases ours, so also it increases and will increase her demands for what we produce. The southern people, of whom it was said before the war, that they knew not economy, and were more extravagant than the north, have, in their adversity, learned frugality, and are applying themselves with new energy to the work of repairing damages and of getting rich. A crop of cotton for the present year, which will yield almost $300,000,000 in gold, tells us what they can do there, before the smoke of battle has fairly cleared away. Just as soon as they are re-established, as they ought to be, in the great family of States; just as soon as the jealousy and strife of section shall pass away; just as soon as the proper relations between capital and labor shall be perfectly adjusted, the southern States will rise to a condition of prosperity, such as they have never known before, and will stand side by side with the most favored of their northern sisters.

Our country, notwithstanding the great debt which rests upon it, cannot fail to grow rich and prosperous, if our people will be economical.

The extravagance of the age in which we live, however, must be checked, or, with the corruption and demoralization which attend it, will come disaster and distress. There is no estate so large that a spendthrift cannot exhaust it. There is no people so powerful that extravagance and corruption cannot destroy them.

Our exports of the great staples, will bring neither national nor individual wealth, if they go only to pay for luxuries which enervate and corrupt.

Far be it from me, to deny to any man or woman, the enjoyment of anything which will contribute to his or her peace and happiness. But the nation is in debt $2,500,000,000, more than $1,000,000,000 of which is held by the people of other lands. What the nation owes, the people owe, and what the people owe, each individual owes, for we are sureties and bondsmen for our country and for each other.

Bondsmen, indeed! and who is so much a bondsman as the debtor?

There is no way to get out of debt but one, either for nations or for individuals. A man cannot pay his debts by giving his note, nor,

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can any government pay its obligations by the issue of irredeemable paper. There is but one standard of value, and that has been fixed by the common consent of the world; and by that standard must all debtors ultimately be judged. As no quack remedies can remove deep-seated diseases, so no ingeniously devised financial schemes, can point out any but the one way to pay a nation's debts.

When a man has violated the laws of health, and finds his system broken, and his physical powers weakened, there is no medical specific which can save him. He must cease the practice of dissipation and folly. He must nurse his exhausted energies. He must economize his wasted strength. He must develop, as best he can, his physical powers. So it is with our country, which has been called upon for profuse expenditures. It has within it elements of strength and the means to meet all its obligations, fully and fairly, if it will; but it must diminish its expenses, as well as increase its revenues. It must stop waste, and develop all its resources. It must labor in earnest, and economize in earnest. If a farmer owes $1,000, the payment of which is secured by a mortgage, he can pay it if he will, by his labor and out of his land. If he neglects his farm; if he and his sons and daughters are extravagant and wasteful; if family discord destroy the peace of his home; if a reckless dissipation characterizes his life, he will add to his obligations, and will not pay his debt. So with the nation. The labor of the country, and the great area of its territory, upon which the whole national indebteness is a lien, can sustain the credit of the government and pay its obligations. But, if the people, who are the laborers, are extravagant and idle; if strife, discord and contention shall prevail among them; if passion and folly, instead of judgment and good sense, shall control them; if hatred, rather than love of one another and of their common country shall move them, then the national honor will be imperiled. I have read many learned essays on the question of "How to pay the national Debt." When men ask me what financial theory I have, I answer "Only one; and it is this: A union of people and of States; a hearty joining together of all sections in the common work of re-establishment and restoration; industry, prudence, retrenchment, and economy. Increase your earnings; diminish your expenditures. Save when you can and spend only when you must, and let the whole world see that you mean to pay your debts."

If the people are extravagant, the government will be. The stream cannot rise higher than its source. The representative will not be

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better than those he represents. Other peoples have sunk under the crushing weight of individual and general extravagance and folly. Let us take warning by their examples, and in doing so avoid their fate.

And now, my friends, a parting word. You have a noble occupation and great duties and responsibilities. You ought to strive to model your lives after the highest human standard. Shall I describe to you the model American farmer? The practical man will say the sketch is a fancy one; well enough in books and pictures, but too poetical and fine drawn for the corn field and the meadow. Yet in every picture however highly colored, we may find some true features worthy of being copied and preserved. The model American farmer loves his calling and appreciates the good and beautiful things by which he is surrounded. The snow-clad fields of winter, the soft verdure of spring, the ripe wealth of summer and the glory of the autumn, are as dear to him as they are familiar. The noise of running brooks and the dripping of the fertilizing rain are music to his ears; the whisperings of the great trees of the forest are sweet to him; his eye is trained to note the changeful phases of the sky, and his mind quick to interpret them. The hum of busy trade does not bewilder him; nor the glare of the distant city dazzle him; his heart is full of a comprehensive love of nature, and he is content to work on with her in her own calm and deliberate method of working.

He is honest, patient, industrious, thrifty. Nature does not cheat him of just reward, nor does he shirk his share of duty in the universe. Every day imposes on him its daily labor; but he knows that every season will vary his work, and so refresh and relieve him. The gifts which he receives from nature's hand he is ready to mete out again with no niggard hand. He is cheerful, hospitable, kind-hearted.

Friendly intercourse with his neighbors lightens his toil, takes from the sharpness of temporary adversity and adds to the pleasures of his prosperity. He has entire respect for his calling and for himself, and feels that he has full play in his occupation for brain and muscle, and need overwork neither, although the mouths to be fed are too many, and the processes of nature too slow to admit of indolence or waste. The buildings which shelter his family and those which protect the cattle who contribute to his support are in good repair and cleanly, without regard to ostentation. He is kind in his treatment of the dumb beasts who are his submissive servants, nor does he grudge a little fruit or grain to the birds of the air who help him in his warfare with insects, and many of whom cheer his life with their songs.

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He opens his eyes to the sunny side of life and seeks not out its dark spots as an incentive to grumbling. If sickness or other misfortune befall a neighbor, he is ready with sympathy, with active aid to the extent of his ability; and in turn he counts on his neighbors' help should he need it.

He is patriotic; a firm friend of liberty, of order, of law. He glories in the grandeur and honor of his country, and is content to contribute, in his quiet life, to the general good by making himself, and of those about him, good, honest, faithful men and women.

He is religious. Living always in sight of the Creator's beautiful works, his heart expands daily in thankfulness for the many pleasures which God has given to him, free of cost, and he shows his gratitude in his daily life.

Contented, yet desirous of improving his condition; too proud of his independent lot to envy others who may be clothed in gaudier trappings, yet kindly to every man and submissive before God; saving, from a sense of duty and not from avarice; faithful and loving to his family; honest and frank in all his dealings; thankful that so few temptations surround him, yet watchful against evil; truckling to no man, yet scorning none; not given to grumbling at the weather, but greeting cheerfully alike the sunshine and the rain; earnest in his political duties, a lover of nature, a lover of mankind, and a lover of God. There, my friends, you have my model of an American farmer.

WARREN.

The annual meeting of the society was held at French Mountain January 5, 1869.

The treasurer presented his report for the previous year in detail, with vouchers. The same was referred to a committee of three, who examined it and pronounced it correct.

The following officers were then chosen for the ensuing year: President, Henry Griffing; Treasurer, Charles W. Osborn; Recording Secretary, A. Newton Locke; Corresponding Secretary, W. H. St. John.

The exhibition took place Tuesday, Wednesday, Thursday and Friday, September 21st, 22d, 23d and 24th, being protracted one day longer than customary in consequence of the unfavorable weather of the first two days.

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The number of exhibitors, as also the number of entries, was largely in excess of former years. The show of farm and garden produce was very full, and of unusually choice quality. In this department, we are free to say, no better exhibition has been made in this section of the State or country. Visitors from neighboring counties were loud in their laudations of the skill of our most excellent farmers. The entries in live stock were large, and the usual varieties of Spanish Merino, long-wool, cotswold and grade sheep were shown with a warrantable pride, and excited the admiration of all. The line of cattle was increased by the introduction of an Alderney bull, the first one brought to this county, it is believed. Some very fine Ayrshires and Devons were shown; also Durhams and natives. In horses, for speed, style and market value, a manifest improvement is being made. For "all work" and "roadsters," our people are determined that none shall excel them; and an evidence of the advantages growing out of the existence of our society, is the increased attention paid to breeding stock. The choicest qualities of swine have been introduced into our county, and our stock growers are vieing with each other in improvements. Nearly every variety of poultry was shown, and, as usual, merited the acclamation, "splendid."

The entries in the implement department were large and embraced the latest improvements. In carriages and heavy wagons, a magnificent display from our shops was made; and many who have hitherto purchased their carriages in the cities will patronize home industry, satisfied that equally good work can be done here. Very fine specimens of marble and slate were exhibited, taking rank among the first in the country. Clothing, and boots and shoes, from the shops of workmen who need not be ashamed to exhibit the fruit of their skilled toil; and a large assortment of stoves, and fine display of hardware, from our dealers. Sewing machines, knitting machines, and a hundred devices for relieving the housewife of her labor; and in the line of needlework there was such endless display that only one who has had his mind systematized to it should undertake to speak of this department.

Crops.—Winter wheat but little raised; crop better than usual; yield about twenty bushels to an acre. Spring wheat about fifteen bushels to an acre; not so good as in previous years. Corn, a light crop; cold and backward season; about twenty bushels to the acre. Rye, good crop; about ten bushels to the acre; a large amount is raised. Barley very little sown. Oats never better; yielded over fifty bushels to the acre. Buckwheat, a fair crop, say twenty bushels to the acre. Pota-

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toes, large yield; somewhat diseased; average about eighty bushels to the acre. Peas, but little attention paid to them. Beans, a small yield. Hay, a better crop than for many years; average about two tons to the acre. Fruit: apples, light crop, but a noticeable improvement on former years; plums good, usual crop; grapes good; pears, fair crop; peaches, very few in county.

Financially, the fair was a success. We take great pleasure in directing your attention to the treasurer's report herewith; and in comparing with the reports of previous years, it will be discovered that the managers are determined that our society shall take rank among the best.

Receipts.

Cash in treasury January, 1869	$223 75
Miscellaneous	332 00
901 member's tickets sold	901 00
Admission	1,328 02
Cash from State	97 50
	$2,882 27

Disbursements.

Expenses	$782 02
Races	250 00
Premiums	670 50
Cash in treasury	1,179 75
	$2,882 27

A. NEWTON LOCKE,
Secretary.

WASHINGTON.

I beg leave to present the transactions of the Washington County Agricultural Society, for the year just closing, together with a brief survey of the interests to be promoted by the successful action of the society.

The twenty-eighth annual fair was held on the society grounds at Salem, September 29th and 30th, and October 1st; the weather in every respect being all that could be desired for the occasion. The attendance of people was larger than at any previous fair, and the interest manifested in the results of the exhibition gave unmistakable evi-

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dences that the society from year to year is getting more and more into favor with all who take the pains to acquaint themselves with its aims and efforts.

The first day of the fair was devoted mainly to preparation for the two following days; at its close, the secretary's books showed a list of 1,190 entries; on each of the two succeeding days the commodious grounds and buildings were filled to overflowing with gathering crowds.

During the afternoon of the last day an interesting address was delivered by W. H. Tefft, Esq., of the Washington County Chronicle, replete with practical wisdom and sound theory, and listened to with almost breathless interest by assembled thousands; after which, the secretary's report was read, the premiums awarded and paid.

Disbursements on account of premiums and expenses of the fair amounted to $2,497.11, leaving balance for future use of $1,714.68, showing a healthy condition of the treasury. As further evidence let us note the balances of five previous years in

1864	$1,004 00
1865	1,309 00
1866 (a whole week of rain)	571 00
1867	1,140 00
1868	1,493 00

The present prosperous condition of the society is owing largely to the signal ability of the Hon. I. V. Baker, Jr., for two years its presiding officer, and also particularly to the untiring devotion and superior executive qualifications of William M. Holmes, and R. W. Pratt, Esqs., who have respectively for a series of years held the onerous positions of treasurer and recording secretary.

The exhibition, in some of its departments, was somewhat meagre; but, as a whole, realizing the anticipations of the friends of the society. The show of cattle was good in quality, but in numbers not such as to do full credit to a county that contains so many fine herds of Ayrshires and Durhams. Very much better filled was the sheep department, though here were seen many tenantless yards. Swine and poultry were well represented, particularly the latter.

This year horses were the principal attraction of the stock department. A long list of entries, comprising several noted single animals and teams, and almost a countless line of young stock and brood mares of various styles, under the eye and guidance of many of the

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celebrated horse trainers of the county, tended to make this part of the exhibition one of vast interest and excitement, which continued during the whole period of three days.

In the department of mechanics and farm implements the display was very much superior to that of former years. A growing necessity for improved tools and machinery for agricultural purposes has stimulated their invention, improvement and manufacture, and the makers of them are learning that a short route to market for these articles leads through the grounds where agricultural fairs are held. A better show of carriages, wagons, harness or stoves could rarely be seen outside of a large city.

Grains, vegetables and fruits filled their appropriate departments satisfactorily. Notwithstanding the season had been quite unfavorable to tillage and fruit husbandry, the exhibition both in extent and quality by far exceeded the average of former years. The display of dairy products was very meagre, indeed. Domestic hall and the ladies' department presented unusual attractions, aside from the brilliant throng of "Old Washington's fairest and best" that crowded its precincts and passage ways. The goods and samples of handiwork and skill there competing for favors were of a superior order of merit, and well deserve the rich encomiums bestowed on them by visitors to the fair.

Our society was organized in 1841, and has not failed of an annual and successful fair except in 1862; in which year its grounds were given up as a rendezvous for the famed Washington county regiment (123d New York Volunteers), then forming; that under the leadership of the dauntless and lamented McDougall followed the fortunes of war on the Potomac and Rappahannock; threw its defiant banner to the breeze at Lookout Mountain, thence joining the vanguard in the "great march to the sea."

Probably no county in the State is more favorably adapted to a varied system of agriculture than is ours; comprising, as it does, nearly every quality of soil and surface; therefore, no one branch of husbandry is exclusively pursued.

Formerly, aside from the lumbering business we were all agricultural people, and farmers from necessity sought a market for their products outside the county. Now very much of these products are needed for consumption at home. The many streams running westward from the Green mountain slopes as they tumble toward the Hudson, and over the dykes and upheavals of the rock strata and the water-shed that supplies Lake Champlain, furnish sites and

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water-power to nearly every neighborhood; while on a larger scale Wood creek at Whitehall, the Mettowee at Granville, and Batten Kill at Greenwich contribute largely to stimulate manufacturing enterprise; still more the noble Hudson, as it pours its volume of waters from the "northern woods," into the county at or near Glen's Falls, bearing on its current annually millions of saw-logs for us to manufacture, literally gives us at Sandy Hill, Baker's Falls, Fort Edward, Fort Miller and Schuylerville miles of water-power unsurpassed and ample to drive the manufactories of a nation. Enterprising capitalists have availed themselves of many choice localities, and thriving villages are growing up on all their streams where are found markets alike for skill, labor and the products of the soil.

Very large bulks however, of three staple crops, potatoes, hay and wool as well as the products of the dairy, yet go abroad for a market.

SYNOPSIS OF CROPS.

Wheat. Both the winter and spring varieties gave us a fair yield and the quality of grain good; this crop is receiving more attention than formerly.

A large breadth was sown to rye; yield and quality inferior. An extraordinary and unexpected demand for straw for manufacturing fortunately encourages the cultivation of this crop.

More corn was planted than usual, but a cold and backward season reduced the yield fully one-fourth below an average.

Potatoes, particularly the later varieties, did remarkably well, producing the usual yield of 1,000,000 bushels; but the rot, and the amount and high price of labor necessary to grow them, and the extreme low returns from them in market, will materially influence farmers to attempt less with this crop in future; and we think the general interests of agriculture will be benefited by the change.

Oats in quality and quantity have not given as good returns for ten years preceding. The amount of crop is nearly double the usual annual average.

Barley and beans not very largely cultivated; the latter coming into store in prime condition, will be more extensively grown in the coming year. About one-half the usual amount of buckwheat was sown; the yield was satisfactory.

Grass and hay never were better. The latter was secured in the finest order, making at least twenty-five per cent additional to an

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average crop. The valleys of the Hudson and of Wood creek furnish large quantities for exportation.

Growing of wool is decidedly on the decrease. Many large flocks of the finest grades of sheep are completely broken up.

Dairying is looked upon by farmers with more favor than formerly; extensive tracts of country are being secured to that interest. Cheese factories are in operation during their season in nearly all our towns. This branch of husbandry is now more remunerative than any other department of agriculture.

The condition of the fruit interest will be fully reported to you through the county horticultural society.

Rearing and fattening swine is but a small item of business compared with what it formerly was. Fattening beef and mutton is on the increase, and will be still more largely carried on as farmers give up the, at present too extensive, growing of potatoes for the hardy grains.

Eggs and poultry form an important item among producing interests, and the business is destined to extend.

A very considerable and profitable trade in raising and training of horses has grown up in the county, adding much to its material wealth. Other industrial and agricultural pursuits are prospering within our borders; but these details suffice to show that we, at least, hold the keys to material prosperity.

At the annual meeting held at Argyle on the 18th day of January, 1870, the following officers were elected, viz.:

President, Col. Berry Long; Treasurer, William M. Holmes; Recording Secretary, R. W. Pratt; Corresponding Secretary, M. Ingalsbe.

Receipts.

Balance, 1869	$1,493 54
State	299 80
Receipts, fair	2,327 45
Miscellaneous	91 00
	$4,211 79

Disbursements.

Expenditures	$2,497 11
On hand	1,714 68
	$4,211 79

MILO INGALSBE,
Cor. Secretary.

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WAYNE.

This society held its annual meeting in the village of Lyons January 5th, and elected the following officers for the ensuing year:

Hon. D. W. Parshall, President; Samuel I. Cole, Treasurer; John L. Cole, Secretary.

The following report from the treasurer was received and adopted:

Amount received exclusive of State appropriation.....	$646 89
New York State appropriation	307 00
Amount received from all sources	$953 89
Amount expended for all purposes.....	$846 15
Cash on hand to balance	107 74
	$953 89

The society is in the possession of seventeen acres of land located on the bank of the Clyde river, in the village of Lyons. On this is a half mile track well graded for the trial of speed of horses. A large and commodius building had formerly been erected on the society's grounds for its annual exhibitions, but unfortunately it has been consumed by fire. The soil and climate of this county are favorable to the raising of grain, grass, and fruit of many varieties. Wheat, the past season, has been a full average crop, and of excellent quality. The midge that formerly almost destroyed the white wheat, has disappeared, and this variety is now raised quite commonly, with a yield per acre that equals former years. Barley is in quantity one-third more than last year, and overruns in weight. Oats double in quantity.

Corn, owing to the long cold wet weather in the fore part of the season, matured only on warm dry land. There is probably one-third less corn than last year. Buckwheat not quite an average. Beans about the same as last year. Peas not much raised of late. Clover seed a great failure. Potatoes excellent. Hay abundant, but the early mown greatly damaged by long wet weather.

The farmers of this county have turned their attention for a number of years to growing peppermint. It was estimated that 80,000 pounds of oil was produced in Wayne county in 1868, which was sold in Lyons at $4.50 to $5.00 per pound; the yield that season was from twenty up to forty, and in some few instances fifty pounds to the acre. So great was the mania for growing peppermint, that mechanics left their shops and paid twenty-five dollars per acre for the use of land,

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and from five to six shillings a rod for the roots to plant it; laboring men received from twelve shillings to two dollars per day to work in the mint. There was probably more than twice the number of acres growing mint last summer than ever before, but the yield was only from ten to thirty pounds per acre. The price paid at the opening of the market was three dollars, but dropped to two dollars, leaving some wiser, if not richer, than they were before they went into raising peppermint.

Tobacco is grown in considerable quantities, and commands this season from eighteen to twenty cents in the leaf; the yield per acre is about 1,500 pounds.

Onions fall considerably short of their average. The yield is about 500 bushels to the acre; price from eight shillings to nine shillings per bushel.

The quality of apples is good, but not a full crop; about 75,000 barrels shipped; price realized, about three dollars per barrel. Pears, quinces, peaches, cherries, plums, and berries of different kinds are raised, and shipped to the east in large quantities. Isabella and Catawba grapes have not ripened well, and are giving way for earlier varieties.

Receipts	$641 89
Disbursements	601 53
Cash on hand	$40 36

JOHN L. COLE,
Secretary.

WESTCHESTER.

This society held its twenty-fifth annual fair on its grounds, in the township of Greenburgh, on the 6th, 7th, 8th, 9th, 10th and 11th days of September, 1869. The exhibition was opened under the most favorable auspices, giving assurance (weather permitting) that it would be satisfactory to the public, and such as would justify the managers in their very liberal list of premiums, and preparatory disbursements. The accommodations had been greatly enlarged since the last fair by the erection of additional stalls, a building for the protection and exhibition of poultry, and a spectator's stand, involving an outlay of about $3,000.

In consideration of fault having been found with the absorbing interest manifested in fast horses, to the alleged injury or neglect of

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other departments of the fairs, the first four and a half days were set apart for a strictly agricultural exhibition, and the remaining day and a half reserved solely for trials of speed. This arrangement with a very liberal list of premiums, it was hoped, would obviate all complaints, prove entirely satisfactory to our farmers and insure a splendid agricultural show. Yet the aggregate entries fell 115 below those of 1868, of which decrease eighty-three were in farm products. The decrease affected nearly all the classes, but in none was it so painfully apparent as in that of poultry. The exhibition in that class in 1868, had been the finest ever seen in the county, and was probably never surpassed at any county agricultural fair in the State. The exhibitors on that occasion were urgent for better accommodations, and a more extensive list of premiums. To meet their wishes, the managers enlarged the list of premiums on fowls, by adding nearly all the varieties for which premiums are offered by the State poultry association; and by erecting a spacious building for their exhibition and protection. Yet the entries were fifteen short of those of the previous year.. There was also an aggregate decrease of thirty-five entries in neat cattle, and thirteen in field crops. This falling off in the staples of an agricultural exhibition, was very mortifying, and does not redound to the credit of our farmers. Yet notwithstanding their want of public spirit, the exhibition, though not as large as in former years, was highly gratifying, and unsurpassed in excellence by any ever held in the county. The show of horses in the agricultural department was a magnificent success. Every class was fully represented by animals which would do credit to any county in the State or any State in the Union. Among the contributions to the draught class, was a splendid team of imported matched Percheron mares, exhibited by William H. Aspinwall, Esq., but entered too late for a premium. They attracted general admiration, and are probably unsurpassed by any team of that breed ever exhibited in the United States.

Although the entries of neat cattle were deficient in numbers, they maintained their character for points of excellence, and were, with scarce an exception, judged worthy of premiums.

The show of sheep was small, and can never be otherwise until the defenceless animals are better protected from the thousands of wortbless dogs running at large in the county.

The exhibition of swine did not correspond with an enlarged list comprising nearly all the most popular breeds, and a very liberal increase in the amount of premiums offered.

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Although several of our old poultry fanciers failed to exhibit anything, the birds on show were of a high order, in fine condition, and possessing largely of the points of excellence as established by Tegetmeier and adopted by the State association.

In dairy produce there were no samples of cheese, but there was an increase in entries of butter. The latter article was pronounced delicious by the judges, who found it difficult where all was so excellent to determine which was best.

There were only ten entries in field crops, being about the average of the last eight or ten years. This is a very small number for such a county as Westchester. Yet previous exhibitions have shown what the lands of the county under proper cultivation can be made to produce. Within those years premiums have been awarded for 41½ bushels of wheat to the acre, weighing sixty-four pounds to the bushel; twenty-eight bushels of rye, standard weight; 109 bushels of corn, weighing 56¾ pounds to the bushel; 326 bushels of potatoes; 1,000 bushels of rutabaga; at the rate of 1,000 bushels of onions, and at the rate of 600 bushels of carrots to the acre. This year Bartholomew Gedney, Esq., of White Plains, competes for a premium on 524 bushels of shelled corn, fifty-six pounds to the bushel, raised on five and one-fourth acres of land.

Garden vegetables exceeded in quantity and quality those of the preceding exhibition. This was no more than could be reasonably expected, as the list is the largest and the premiums the most liberal in the State. The same may be said of fruit. Notwithstanding the absence of several old and extensive contributors, the entries were more numerous than in 1868, and the specimens equal to any ever seen on the tables. Conspicuous among the contributions were those of the veteran vineyardist, Doctor R. T. Underhill, ex-president of the society. His show of grapes and sparkling Catawba and other wines was very fine.

The display of flowers was very rich, tastefully arranged, much larger than in 1868, and added greatly to the attractions of the hall.

In household manufactures (ladies' department) there was a great deficiency (amounting to twenty-six entries), caused, it is said, by former exhibitions of fancy articles purchased in the stores.

Agricultural implements were few and far between.

The awards of premiums were announced from the judges' stand at twelve o'clock, noon, on Friday, and the agricultural exhibition closed.

Trials of speed were immediately commenced and continued until

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sundown; renewed on Saturday, and terminated on the evening of that day. These trials were very gratifying to an immense number of spectators, and no doubt added very much to the receipts of the fair. Good order prevailed during the entire exhibition.

The amount of premiums offered in money or plate, exclusive of medals, was $3,300 and 400 books; the awards amounted to $2,400, three silver medals and 400 appropriate books.

The receipts from all sources were	$5,730 35
From track committee	1,349 75
	$7,080 10

REPORT OF TRACK COMMITTEE.

The undersigned, appointed by you at your last annual meeting as a track committee, for the taking care of and regulating the track belonging to you on your fair ground, beg leave respectfully to submit to you the following statement of their receipts and expenditures during the past year:

Total amount received for membership of the track, use of track, and money received from grand stand	$1,349 75

Expenses.

Paid for keeping track in order, and repairing same, together with wages of gate-keeper, printing, advertising, etc.	$363 41	
Paid builder of grand stand	950 00	
Making a total of		1,313 41
		$36 34
Paid N. Holmes Odell, treasurer, and now in his hands		20 00
Leaving a balance in the hands of the chairman of this committee of		$16 34

R. C. DOWNING, *Chairman.*
C. E. JACKSON.

Dated *December* 7, 1869.

TREASURER'S REPORT.

To balance cash on hand	$373 89
Cash received for memberships at annual meeting of the society, 1869	318 00
Loan made of First National Bank of Tarrytown, to meet expenses of the society	800 00

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Receipts at Fair, 1869.

Received for sale of tickets, etc.	$4,945 35	
Per centage on premiums	489 00	
For stands, entry fees, etc.	296 00	
		$5,730 35
To State appropriation for 1868		355 00
		$7,578 10
Less amount paid out		5,878 90
		$1,699 21

J. O. MILLER,
Secretary.

WYOMING.

The display of stock of all kinds at our last fair excelled all our previous ones. The display of horses was, in the judgment of many, not excelled at the State fair.

The yield of apples was very large in this county, although fully one-third were frozen on the trees and became of little or no use.

There was also a large yield of vegetables of all kinds.

More cheese was made last year than ever before in this county.

The yield of fruits of all kinds was a success, notwithstanding the partial loss by being frozen.

Milch cows are now being brought into this county in large droves from Canada and Michigan, to supply the increased demand occasioned by the continued increase of cheese factories.

The demand for Wyoming county cheese is fast increasing and is quoted as a standard cheese in the New York market.

Financially also the fair was a success, as more money was received by the treasurer than for many years.

Receipts for 1869	$1,397 22
Disbursements	1,049 17
On hand	$348 05
Due the society and not paid	106 00
	$454 05

Officers, 1870.—President, E. B. Chace, Castile; Secretary, L. L. Thayer, Warsaw; Treasurer, H. A. Dudley, Warsaw.

L. LOCKWOOD THAYER,
Secretary.

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YATES.

The Yates County Agricultural Society was organized in the year 1840, and has continued to hold agricultural fairs from that time to the present. The annual fair for 1869 was held upon grounds owned by the society in the village of Penn Yan on the 5th, 6th and 7th days of October. The weather was pleasant, the exhibition good and the attendance unusually large. The season proved a favorable one, and the farmers of the county realized large crops of wheat, barley, oats, corn and hay.

The number of entries for premiums at the fair was 800.

The amount offered for premiums was $1,123.75, and the amount awarded $712.

The annual address was delivered by Hon. John Cochrane, and was listened to with marked attention by the people present.

The show of cattle, horses, sheep, swine and agricultural implements fully equaled that of any previous year, and was pronounced far better than that of neighboring counties by persons who had attended other fairs.

Received for membership and admittance to the fair		$1,538 37
Paid premiums of 1868.....	$13 50	
premiums of 1869.....	664 25	
expenses of 1869	675 11	
		1,352 86
Balance		$185 51

Number of members 703.

GEO. Y. EASTMAN,
Secretary.

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REPORTS

OF TOWN AND UNION AGRICULTURAL SOCIETIES AND FARMERS' CLUBS.

Annual Report of the Board of Trustees of the American Institute of the City of New York.

The trustees have the satisfaction of reporting that the financial condition of the Institute is even more favorable than they had anticipated. Surplus funds up to this date have been sufficient to purchase $40,000 of United States bonds. For a detailed account of receipts and expenditures during the past year reference is made to the statement of the committee on finance. The unencumbered real estate on Broadway and Leonard street, belonging to the Institute could not be disposed of since no offer for it has yet reached the sum below which the trustees are directed by resolution not to sell. Its actual value will not soon decrease, because it is located within the most valuable part of the city area devoted to wholesale trade.

Owing to a depression of business, rents are lower, and the trustees have been compelled to let this property at a less rate than that received the past two years.

By the action of the Institute, to which allusion was made in the last annual report of the trustees, in relation to providing space for an exposition by the National Association of Wool Manufacturers to be given under the auspices of the Institute and in connection with its exhibition, new and extraordinary duties were imposed on the present board of managers. They met the emergency by securing for the joint exhibition, the largest structure to be obtained, although it was more than four miles from the City Hall and its enlargement involved the outlay of more money than had before been expended by the Institute for such a purpose.

This bold undertaking was looked upon by many with distrust, since no previous attractions had been potent enough to draw large crowds continuously to that point. Yet the result confirmed the foresight and judgment of the managers.

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The gross receipts of their undertaking amounted to more than $61,000 and the net proceeds, including the sum expended for buildings and materials to be used for the exhibition of 1870, exceeded by several thousand dollars the profits of the successful preceding fairs. To the energy, watchfulness, and self-devotion of a majority of the present board of managers, and to the good taste and executive ability of the officers of the National Association of Wool Manufacturers, the Institute is chiefly indebted for the most complete and satisfactory display of American productions ever made, and for its financial success.

Reports from the several standing committees will show, that all the other departments of the Institute have evinced commendable activity during the past year. Unabated interest has been kept up in the weekly proceedings of the Farmers' Club and the Polytechnic Association, as well as in the monthly meetings of the Photographical Section.

Large additions of valuable scientific works have recently been made to the library, which now occupies nearly all the available space in the rooms at present occupied by the Institute. The most certain and gratifying evidence of the increasing influence of our organization, is found in the very large accession of new members during the past year.

In accordance with the desire expressed at the close of the course of the scientific lectures delivered before the Institute last winter, the trustees made arrangements for a similar, but shorter, course for the present season, and the following programme of the lectures was issued:

I. Friday, December 17th, 1869. "The Battle-fields of Science," by Andrew D. White, President of Cornell University, Ithaca, N. Y.

II. Friday, December 24th, 1869. "How Animals Move," by Professor E. S. Morse, of the Peabody Academy of Science, Salem, Mass.

III. Friday, December 31st, 1869. "The Corelation of Vital and Physical Forces," by Professor G. F. Barker of Yale College, New Haven, Conn.

IV. Friday, January 7th, 1870. "The Air and Respiration," by Professor J. C. Draper, of the College of the City of New York.

V Friday, January 14th, 1870. "The Connection of Natural Science and Mental Philosophy," by Professor J. Bascom, of Williams College, Williamstown, Mass.

VI. Friday, January 21st, 1870. "The Constitution of the Sun," by Dr. B. A. Gould, of Cambridge, Mass.

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VII. Friday, January 28th, 1870. "The Colorado Plateau; its Canons and Ruined Cities," by Professor J. S. Newberry, of Columbia College, New York.

It will be observed that this list only contains lecturers who had not previously appeared before the Institute.

The whole programme was carried out with no change or failure, and at an expense not exceeding one-half of that incurred for the preceding course. The audience at these lectures consisted mainly of members of the institute and their families; and as the attendance was uniformly large, it may be regarded as fortunate that this means has been devised for drawing together, at least for a few nights of each year, those who evince a fondness for scientific investigations.

The twenty-ninth annual report of the American Institute to the Legislature of the State is the largest, and, without doubt, the most varied and valuable volume of Transactions ever issued by this institution.

Respectfully submitted.

HORACE GREELEY,
DUDLEY S. GREGORY,
CHARLES P. DALY,
CYRUS H. LOUTREL,
GEORGE PEYTON,
SAMUEL D. TILLMAN,
SYLVESTER R. COMSTOCK,
Trustees.

New York, *February* 3d, 1870.

Receipts and Disbursements of the American Institute of the City of New York, for the year ending January 31, 1870.

Balance in bank, January 31, 1869..... $5,004 67

Receipts.

Rental of property.....	$18,500 00	
Admission fees, dues and from life members	4,695 00	
State appropriation, 1868.....	2,315 63	
Interest on investments.....	2,229 97	
From managers of 38th annual fair.....	15,000 00	
Miscellaneous sources.....	33 01	
		42,773 61
Carried forward.....		$47,778 28

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Brought forward		$47,778 28

DISBURSEMENTS.

Taxes and assessments on property	$2,587 00	
Fire insurance and repairs	311 04	
Books, periodicals and binding	284 81	
Rent of rooms at Cooper Union and gas-light	2,214 70	
Printing and stationery	117 36	
Freight and expenses—Transactions from Albany	39 26	
Balance course of scientific lectures, 1868–69	777 36	
On account of course of scientific lectures, 1869–70	767 00	
Reporting for Polytechnic and Photographical Sections	114 00	
Appropriation to chairman finance committee of board of managers	250 00	
Salaries	4,378 00	
Newspapers, advertising, postage and incidental expenses	534 76	
	$12,375 29	
Invested in United States 5–20, bonds of 1867, 1868	34,630 00	
		47,005 29
Balance in bank, January 31, 1870		$772 99

THOMAS M. ADRIANCE,
THOMAS WILLIAMS, JR.,
CHARLES CHAMBERLAIN,
SIMEON BALDWIN,
J. DELAMATER,
Finance Committee.

NEW YORK, *February 3d*, 1870.

The Committee on Agriculture report that their official duties have been confined to and connected with the Farmers' Club, which continues to be crowded each week with an interested audience, and its usefulness is acknowledged in thousands of letters received from every state and territory in our country. During the year many valuable and interesting papers have been read upon particular subjects connected with stock raising, agriculture and fruit-growing, by Dr. J. V. C. Smith, Prof. J. A. Whitney, J. B. Lyman, Esq., Dr.

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F. M. Hexamer, A. S. Fuller, Esq., Professors Horsford of Cambridge and Lamacier of Paris and others. To the press of the city much is due for their elaborate reports of the transactions of the club. During the year, committees from the club have visited various places in our own State, Connecticut, New Jersey, Pennsylvania, Virginia and Florida, and much valuable information has been obtained as to soils, crops, fruits and other matters of great importance to agriculturists.

In no case has the treasury of the American Institute been called upon to pay anything for expenses incurred by any of these committees.

As the doings of the Farmers' Club are published in the Transactions of the American Institute at considerable length, your committee do not deem it important to extend this report.

All of which is respectfully submitted.

NATHAN C. ELY,
P. T. QUINN,
JOHN CRANE,
J. H. MACY,
SERENO EDWARDS TODD,
Committee.

NEW YORK, *February 3d*, 1870.

REPORT OF THE BOARD OF MANAGERS.

The Board of Managers respectfully report, that on the 15th day of February, 1869, four days after their election, the managers met at the rooms of the institute, and organized the board for the ensuing year, by making the Hon. Orestes Cleveland, Permanent Chairman, Wm. H. Butler, Vice-Chairman, and John W. Chambers, Secretary.

The institute, at a regular meeting on the 5th of November, 1868, having referred the question of providing accommodations for the National Association of Wool Manufacturers, who proposed to hold an exposition of the wool industry of the country, under the auspices of the American Institute, and in conjunction with its regular exhibition; a sub-committee of managers was immediately appointed to confer with the officers of that association. On the 15th of February, Mr. Thomas McElrath, from that committee, reported that the National Association of Wool Manufacturers required at least 15,000 square feet of floor space for their exposition.

It being evident that no place before occupied by the American Institute would be capacious enough for the next exhibition, the board determined to seek new quarters.

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To erect a building of requisite dimensions in time for the autumna. exhibition was quite out of the question, but it was ascertained that by adding a large temporary structure to the Empire Skating rink, situated on the Third avenue, between Sixty-third and Sixty-fourth streets, and having the dimensions of 170 by 350 feet, the whole would probably afford ample accommodations.

Accordingly on the 15th day of March, it was resolved to rent the rink during the months of September and October for the sum of $6,000, and pay any extra insurance which might be required of its owners. A contract was immediately thereafter made for the erection of a temporary building, fifty-four by 170 feet, which the board, at its option, could use for two months, or could purchase for the sum of $4,000. One-quarter of the great hall having been set apart for the use of the National Association of Wool Manufacturers, it was ascertained by the first of September that the part remaining for the use of the Institute could not accommodate all who desired to become exhibitors, and the board thereupon decided to make another addition of twenty by 170 feet. In this all the boilers, and other apparatus requiring fire, were located, while the remaining part of the new building was devoted to steam-engines and machinery in motion. A few light machines, whose operation did not depend on a very solid foundation, were placed at the east end of the rink, and as near as possible to the driving power. For the first time in many years the managers were enabled to devote ample space for the movement of visitors.

A wide promenade extended through the middle of the main hall, and at convenient distances were other parallel avenues of less width. The exhibition tables were placed transversely to these avenues, and the spaces between formed a series of passages extending across the lower and main floor.

All the available room for the use of exhibitors was equitably divided into seven portions, which were respectively occupied by the seven departments into which the exhibition was divided. Each department was under the immediate control of a sub-committee of three managers. The buildings were opened for the reception of goods on the 1st day of September, and on the 8th they were opened to the public. As is usually the case, several days elapsed before all the engines and machinery were in full motion, and the department occupied by the wool industry exposition was completely filled.

Notwithstanding the great distance of the place of exhibition from the business center of the city, the attractions presented were so novel

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and numerous that large crowds were drawn to it, during every day and evening, until its close. Every department of the exhibition, under the direct control of the managers, contained many articles of unusual merit.

It would be impossible to enumerate them within the limits of an ordinary report, yet it will not be deemed invidious or improper to state that an unusually rich and surprising display of raw and manufactured silks was made, and that for it, the Institute is indebted to the prompt action of the American Association of Silk Manufacturers, and particularly to the personal exertions of Mr. Frederick Baare.

The exposition of the wool industry, under the immediate direction of the National Association of Wool Manufacturers, contained the largest and richest collection of woolen fabrics ever shown in this country, and, as it furnished a reliable indication of the extent of this branch of domestic manufactures, it excited unusual surprise and interest.

The managers take this opportunity to express their thanks to the judges who officiated in the seven departments of the regular exhibition. Their duties were arduous, but they were performed with commendable zeal and impartiality, and the result of their labors will be seen in the following enumeration of awards which have been made in accordance with their decisions:

	Medals.		
	1st.	2d.	3d.
I.—Department of fine arts and education.....	27	19	5
II.—Department of the dwelling.....	33	51	73
III.—Department of dress and handicraft.....	27	35	8
IV.—Department of chemistry and mineralogy....	24	22	10
V.—Department of engines and machinery.....	70	84	43
VI.—Department of intercommunication.....	21	34	36
VII.—Department of agriculture and horticulture...	27	24	5
Total of each medal.....	229	269	180

Total of all medals.....	678
The number awarded at exhibition of 1867 was.....	522
Excess in 1869.....	156

In addition to these, the board has awarded, for the first time in the history of the Institute, the large medal of honor, authorized by article 10, section 13 of the by-laws, for Lyall's positive motion power loom, which obviates the throwing of the shuttle; a plan used in the art of weaving for more than 4,000 years, and which, until lately, was supposed to be indispensable.

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One of the striking features of this exhibition was the series of addresses delivered by gentlemen widely known for the interest they have taken in the progress of the industrial arts. The first was made at the opening, by the president of the Institute, who appropriately welcomed both exhibitors and visitors. The second was by the Hon. S. S. Fisher, of Washington, commissioner of patents, who gave an able review of the triumphs of American inventions, and the prominent part which the American Institute had taken in fostering that creative genius which aims to produce the useful rather than the beautiful, and which has given us labor-saving machines, and all those improvements that tend to alleviate the material condition of man. The third was by Dr. Geo. B. Loring, of Salem, Mass., who advocated, in eloquent terms, the agricultural interests of the country. The fourth was by Mr. Erastus Bigelow, the well-known inventor, and president of the National Association of Wool Manufacturers, who pointed out the true course to be pursued for the encouragement of the production of wool, and for its conversion into useful fabrics. The fifth was by the Rev. Dr. Barnard, president of Columbia College and United States commissioner at the international exposition of 1867, held at Paris, who gave an interesting account of the novelties he saw at that exposition, and who gratified his auditors by the statement that, although the display in the American department was not large, it contained a majority of the most useful and ingenious inventions, and attracted more attention from Europeans than any other part of the exposition. The sixth was by Britton Richardson, Esq., who gave an unexpectedly favorable report of the progress of the silk industry in the United States, and furnished abundant proof that, with proper encouragement, it will yet be able to supply the home demand for silk goods. The last two addresses were made by the president of the Institute and the chairman of the board, on the closing night, before the reading of the awards. They expressed, in glowing words, the congratulations of the board at the complete success of the thirty-eight exhibition.

At a regular meeting of the Institute, held October 7th, 1869, a communication was received from the board of managers, stating that they considered it expedient to hold a fair next year, because a large expenditure had been incurred in constructing buildings and all the necessary attachments thereto, and in providing expensive appliances used in the department of engines and machinery, which could be made available at such a fair. Thereupon it was unanimously resolved that the present board of managers have discretionary power to make

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all preliminary arrangements for the annual exhibition of 1870. In obedience to this resolution, the board obtained a lease of the premises belonging to the Empire Skating rink, for the months of September and October, 1870, and decided to purchase the large building erected for them, which was offered, by its owner, at a sum of $200 less than that stated in the original agreement. They also decided to preserve for their successors all the articles which could be used at the next exhibition.

ORESTES CLEVELAND.	THOMAS RUTTER.
WILLIAM H. BUTLER.	THOMAS HICKS.
THOMAS McELRATH.	SAMUEL R. WELLS.
J. GROSHON HERRIOT.	EDWARD RICHMOND,
CHAS. WAGER HULL.	WILLIAM E. PEARSE.
NATHAN C. ELY.	JOSEPH B. LYMAN.
WILLIAM S. CARPENTER.	WALTER SHRIVER.
GEORGE TIMPSON.	J. V. C. SMITH.
CHARLES K. HAWKES.	SAMUEL D. TILLMAN.
JAMES KNIGHT.	J. TRUMBULL SMITH.

New York, *February 3d*, 1870.

ALLEN SETTLEMENT.

The officers for 1870 are as follows: President, Belden Allen; Secretary and Treasurer, Spencer S. Allen.

This club, like most organizations of its kind, holds meetings every week, which, as a general thing, are well attended and much interest manifested in the discussions which take place. The "Allen Settlement Farmers' Club" take pleasure in announcing to the agricultural community, and especially to farmers' clubs, that they have struck the "key note," which would be well for all clubs to strike.

I presume it is known that as a general thing these clubs hold no meetings in the summer season; but this club has wandered from this rule, and for some time we have made a practice of holding what we call jubilee meetings during the summer seasons. After we adjourn our weekly meetings, some member of the club will extend to his associates an invitation to meet at his residence on the afternoon of the first Saturday in May. Consequently on that day are seen many of our neighboring farmers, with their wives and children, going to the jubilee. Now there are several benefits derived from these meetings, 1st. They have a tendency to form and maintain a feeling that

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ought to exist between neighbors. 2d. It is the decision of the members of this association that we derive as much benefit from these meetings as we do from the winter discussions, for almost invariably while looking at a certain kind of grain or stock there arises a hotly-contested debate upon the management of the article at which we are looking.

Before the meeting adjourns all return from the ramble over our neighbor's farm to his house, and after partaking of refreshments, some member extends to the club another invitation to meet at his residence one month from that time, after which all separate, feeling well pleased with their meeting, and meditating on the many plans of farm management which they have heard discussed.

Before closing I wish to say that this club takes great pleasure in not only recommending, but urging other clubs to adopt the same custom of holding meetings, for two years experience has proved to us that they are a decided benefit.

We have a library of nearly 100 volumes, many of which are works from our best agricultural authors.

SPENCER S. ALLEN,
Secretary.

ANNSVILLE AND LEE.

Amount received from all sources		$686 63
Amount paid for premiums	$127 25	
printing	39 10	
police	44 69	
labor and materials, and repairing buildings	100 00	
toward existing indebtedness for rent of ground and fixtures	380 00	
		691 04
Balance due treasurer		$4 41

JULIUS C. THORNE,
Secretary.

BARTON.

We have to report for the Barton Agricultural Society, for the year 1869, amount of receipts, $684.27; amount paid out for premiums and rent of fair grounds, $711.54. Leaving a deficit for the year of $27.27; and an assessment was made on the stockholders to

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supply the deficiency. The officers for the year 1870 were duly elected as follows: President, William P. Stone; Secretary, James S. Murray; Treasurer, A. B. Phillips. We had our annual fair last September, and it was every way successful; in vegetables and fruit excelling the State fair.

JAMES S. MURRAY,
Secretary.

BINGHAMTON.

An organization known as the "Binghamton Farmers' Club" was formed in this city on the 20th of November, 1869, by a few gentlemen interested in the progress of agriculture. But five persons joined the club the first evening; but the interest has steadily ncreased, and additions have been gradually made, until at present the membership numbers twenty. Meetings have been held every Saturday evening for discussion, and much valuable experience has been drawn out. The discussions have been fully reported in the Republican of this city, and thus whatever of good has been elicited has been disseminated among the farmers of the county and vicinity. The following, among other subjects, have been discussed: "Manures," "The cultivation of fruit," "Cows, the production of milk and its uses;" "Feeding stock in winter," "The cultivation of potatoes," and "Grasses." Many valuable communications have also been received and published. The club is governed by a constitution and by-laws, which are as simple and concise as possible. The officers are a president, vice-president, librarian, and secretary, the last of whom also acts as treasurer. Each member pays an admission fee of fifty cents and fifty cents annually thereafter. The work of the club is not limited to discussion, but embraces all proper means for the advancement of agriculture.

F. N. CHASE,
Secretary.

BROOKFIELD.

In transmitting our twentieth annual summary of the transactions of the Brookfield Agricultural Society, we have the pleasure to say that the stated meetings of the executive board have been regularly attended during the year 1869, and that the policy of former years has in the main been carried out by the board.

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The effort to make our exhibition something more and better for the agricultural interest than a mere horse show, has never been lost sight of, under our present board, and will still be adhered to. The annual fair was held September 28th and 29th, and was well attended, the weather being all that could be desired. The total number of entries in all departments was between 700 and 800, and the whole constituted a show fully up to the average of former years, while the cattle show was conceded to be the best for many years. The report of the treasurer was presented, making the following exhibit:

Total receipts for the year	$571 45
Paid premiums and expenses of twentieth annual fair	526 35
Leaving a balance in treasury of	45 10

The following are the officers for 1870: President, David L. Fisk; Secretary, C. Whitford; Treasurer, Henry Brown.

C. WHITFORD,
Secretary.

CAMDEN.

The following is the report of the Camden Industrial Association for the year 1869:

Gross receipts	$919 85
Total expenditures	639 19
Balance	280 66

The annual fair was held on the 14th, 15th and 16th days of September, 1869. The display of stock at the fair was larger than at any previous exhibition. The display in floral and vegetable halls was very good. The weather was favorable and the attendance good. Altogether the fair was a decided success.

C. J. WRIGHT,
Secretary.

CAZENOVIA.

It is with pleasure the Farmers' and Mechanics' Association of the town of Cazenovia transmit this their thirteenth annual report. The annual fair of the association was held on the 14th and

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15th days of October last, on the Grove Ridge driving park, situated one-fourth mile north of the village of Cazenovia, and in full view of the beautiful Owahgena lake, rendering it one of the most delightful fair grounds in the State. The time of holding the fair was unavoidably postponed to so late a period in the season that the temperature was rather cool for the comfort of the crowd of visitors, yet it was a decided success, both in the various productions on exhibition and the interest manifested by the exhibitors and the public. The whole number of entries was 300. This however conveys but a very faint idea of the exhibition, as many single entries consisted of a large number of sheep, swine, fruits, vegetables or other articles, the largest of which was fifty-eight varieties of vegetables, and many other collections well worthy of the exhibitors. In reviewing the list of entries, I find the number of horses and colts on exhibition was forty-two, number of cattle twenty-five, number of entries of sheep eighteen, number of entries of swine ten, and a large collection and variety of domestic fowls. But without extending the list, every department of agricultural, mechanical and domestic industry and production was a credit to the town and the association. The agricultural productions of the town consist of all the various kinds of grain and vegetables to all of which the soil is well adapted. It also produces large crops of grass of very excellent quality, and the farmers are at present largely interested in the productions of the dairy. There are six cheese factories in the town which have manufactured the past season 812,170 pounds of cheese, and 4,600 pounds of whey butter. There are besides a number of dairies which have been exclusively confined to the production of butter. At the annual meeting held on the eighth inst., the report of the treasurer showed the receipts for the year (including $\$56\frac{74}{100}$ in the treasury), to be $\$361\frac{74}{100}$; expenditures $\$314$; leaving a balance in the treasury at annual meeting of $\$47\frac{74}{100}$; $\$161\frac{75}{100}$ was expended in premiums, besides a large number of books.

The following officers were elected for the present year: President, J. W. T. Rice; Secretary, Milton E. Card; Treasurer, Bowman H. Stanley.

The next annual fair is appointed to be held on Wednesday and Thursday, the 14th and 15th of September, next.

THOMAS CHILDS,
Secretary.

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CLAY.

The officers and members of the Farmers' and Mechanics' Club of Clay make the following report of the crops within their jurisdiction during the year 1869:

Winter wheat, average good; spring wheat but little sown; rye fair yield; barley medium; oats rather better than usual; buckwheat fair yield; corn about two-thirds of a crop; potatoes on sandy loam very good, on clay ground have decayed very badly.

Receipts and expenditures for the year ending Dec. 31st. 1869.

Receipts	$557 62
Expenditures	508 93
Balance in treasury	$48 69

L. HARRIS BROWNE,
Secretary.

CONSTANTIA.

The thirteenth annual show of the Agricultural Society of the town of Constantia, was held on their grounds situated on the shore of Oneida lake, on the 8th and 9th days of September, 1869.

Although much larger and extended arrangments had been made for holding this fair, than any year previous, both in and out of the society, among the farming interests, still on account of the early day fixed for holding the fair, and the heavy and continued rains during most of the time, the turn out and the exhibition failed to realize the hopes of the society previously entertained. The society feel confident, however, that the receipts of the next annual fair, from the interest taken in the immediate neighborhood on all matters appertaining to agriculture and stock raising, will far excel anything of the kind heretofore held.

The officers for the ensuing year who were declared duly elected were: Frederick Hebard, President; Fred'k C. Lander, Secretary; Jerome Taylor, Treasurer.

FRED'K C. LANDER,
Secretary

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CORNING.

Officers of the Corning Agricultural Society, for 1870: Lewis C. Kingsbury, President; Q. W. Wellington, Treasurer; Geo. Hitchcock, Secretary.

I am unable to furnish you with the report of 1869. It was the first year of its organization, and financially was not a success.

GEO. HITCHCOCK,
Secretary.

CUBA VALLEY POINT.

The Cuba Valley Point Agricultural and Mechanical Society of Cuba, Allegany county, N. Y., held its annual meeting for the election of officers August 12th: E. D. Loveridge was elected President; H. I. Swift, Secretary, and J. A. Story, Treasurer, for the ensuing year. The society resolved to change the time of holding the annual meeting to the 3d Tuesday in June of each year.

The fair, during the current year, was held on the 28th, 29th and 30th, days of September, 1869.

Receipts.

Balance on hand at last report	$56 61
From sale of annual membership tickets	307 00
sale of life membership certificates	275 00
entrance fees of horses	554 00
rent of grounds	135 00
entrance fees at fair	1,304 14
special donations for premiums	50 00
	$2,681 75

Expenditures.

Trotting purses	$1,187 50
Other premiums	472 50
Expenses of fair, etc	534 48
Balance	487 27
	$2,681 75

We further report that the second fair was a complete success and that our society is in a flourishing condition.

HARLAN I. SWIFT,
Secretary.

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DELHI.

The annual cattle show and fair of the Delhi Agricultural and Mechanical Society was held on the society's grounds, which are pleasantly situated within the village limits, on the 29th and 30th days of September. The weather was fine, and the extensive grounds of the society were well filled with exhibitors and spectators. The clear weather added to the good appearance of the animals on exhibition.

There was the best show of working cattle ever seen in this county, and the same may be said in regard to cows. For the reason that butter is about the only article of export from this county, more attention is paid to the raising of cows that will produce the richest and largest quantity of milk. Most of the large dairies of this county average nearly 200 pounds of butter to each cow, while many exceed even that amount. Some of our dairymen are turning their attention to Ayrshire and Alderney breeds, the first for quantity and the other for richness. A number of fine specimens of both breeds were on the ground.

Some choice lots of sheep and swine were also to be seen. There was also a fair display of agricultural implements, while the ladies' hall, as usual, attracted a large share of deserved attention.

The display of fruit and vegetables was not large. For several years past, the fruit crop has been a very poor one, and the past season was not favorable to the production of large vegetables, yet there were fine and choice specimens of both on exhibition.

Financially, the society is very much better than last year, when there was barely money enough to pay premiums and expenses and leave a very small balance in the treasury. This year after paying expenses, premiums, rent on land leased, and interest on debt of $1,200, we were able to pay off one-third of the debt and have nearly enough left to repair the damage done by the high water to the grounds, fences, etc.

The officers for 1870 are: Jesse Palmer, President; Norwood Bowne, Secretary; Anthony M. Paine, Treasurer.

ANTHONY M. PAINE,
Treasurer.

EAST MAINE.

The Farmers' Club of East Maine at a recent meeting elected officers for 1870, viz: President, Abm. H. Green; Secretary and Treasurer,

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James Hogg; Librarian, Thomas Hogg. Post-office address, East Maine, Broome county, N. Y.

The club is in good working order, having for the last twelve years hardly ever failed to meet once a week through the winter, and last summer once a month, to discuss subjects pertaining to agriculture.

Financially, we have little to report. We do not hold a fair. The annual dues of members (ten cents) about furnish us with light and stationery. The library contains ninety-two volumes, and last year we have received for distribution among the members thirty volumes of reports from the State and seven from the Agricultural Department at Washington, the reports of a number of special committees, the Journal of the New York State Agricultural Society, and the Monthly Report of the Commissioner of Agriculture, all of which have been to us very valuable.

JAMES HOGG,
Secretary.

FREDONIA.

The following were duly elected officers of the Farmers' and Mechanics' Union, at the joint annual meeting of the Chautauqua Farmers' and Mechanics' Union and Farmers' and Mechanics' Union of Fredonia, held at Fredonia, January 6th, 1870: Stephen Snow, Fredonia, President; David Burrell, Fredonia, Secretary; J. B. Miner, Fredonia, Treasurer.

JOHN S. RUSSELL,
Secretary.

GALEN.

The following are the officers, for the ensuing year, of our town agricultural society: President, Oliver Stratton; Vice-President, Matthew Mackie; Secretary, Wm. H. Peckham; Treasurer, Seth Smith.

Treasurer's Report.

Balance on hand from last year	$34 48
Received for annual memberships for 1869	101 00
Received for tickets at gate	80 54
Total	$216 02
Paid cash premiums and other expenses	153 00
Balance in hands of treasurer	$63 02

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The financial figures do not indicate a heavy business, and in the items there is nothing paid for fast horses or fast girls to ride them; but the business of the society is confined to encouraging the practical requirements of true agricultural progress.

Our small means, with the annual donations of Transactions of State Society and Institute, enable us to hold fairs quite satisfactorily; and now those objectionable features, which we never adopted, though giving us temporary embarrassments in their popular day, are being left out by most societies, we again take courage and know our society is in the right track, and progressive.

We hope the Transactions will be continued to our society, and also the Journal of the State Society, and other estimable agricultural State documents, so long regularly furnished by our lamented and true friend of agriculture, Col. Benj. P. Johnson. My thanks are already due for the continuance of these favors, since the sad loss of our good secretary.

JOS. WATSON.

CLYDE, *January 14th*, 1870. *Secretary.*

GLEN SPRING.

I have the satisfaction to report that the first year's operations of the Glen Spring Farmers' Club have been a decided success. This club was organized in March last, its first meeting being attended by but five persons; and though at a season of the year when the weather was unfavorable and farmers were busy with preparations for spring's work, we soon had a respectable number of wide-awake working members, and moved from the district school-house to an unoccupied church, of which we have obtained permanent possession and which has been fitted up to meet all the requirements of a place for holding our meetings. Meetings are held each week for the discussion of agricultural topics, and occasionally we have an essay or address by some of the members. The discussions, always animated and sometimes sharp, are conducted with the utmost good humour by experienced and intelligent farmers, and are having a beneficial effect upon all who attend these gatherings. One important feature of the club is, that each member is expected to exhibit at some one of the meetings a specimen of grain, fruit or garden vegetable of his own growing, with an account of the soil and treatment by which it was produced. These specimens are preserved in our room and give the meetings the character of a continuous fair; and as each individual is desirous to outdo the rest, the specimens are always choice.

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Each member pays an annual fee of fifty cents, which is expended in the purchase of new or choice seeds or fruits. Our success in this branch during the past season has been highly satisfactory and resulted in the introduction among us of the Early Rose potato (which has fulfilled all its promises), and some of the new and choice varieties of berries and grapes, as well as several garden vegetables with which we were previously unacquainted, and nearly all of which, so far as they have fruited, have proved to be desirable additions to our previous stock. The necessary expenses of the club are paid by voluntary contributions of its members, and we have a library fund, organized and sustained by the liberality of the members, by which we have established a library which, with the addition of nine volumes contributed by your society and the department at Washington, now contains ninety-five volumes.

The club having outgrown its original design as a school district organization, and drawn members from a distance of four or five miles around it, we decided to hold a winter fair in connection with the annual meeting, and a premium list was made out for such articles as were thought suitable to be exhibited at this season of the year. The result was a very gratifying surprise to all who attended the exhibition; 214 entries were made, and 104 premiums awarded. Our room, with a capacity of holding between three and four hundred persons, was filled with visitors and exhibitors, and we claim, and all present conceded the claim a just one, to have had the finest display of fancy work, of fruit and of grain, which was ever made in this county. The annual address was delivered by Schuyler Sutherland, Esq., school commissioner for this county, and was a practical and sensible production by a practical and sensible man.

I cannot close this report without thanks for the encouragement received from your society. The copies of Transactions, sent us through the Secretary of State, have been invaluable to us. The information they impart is just such as all farmers need, and we are looking for the report of 1868 with some impatience. The treasurer reports all debts paid, and a balance on hand of thirteen dollars and forty-one cents. Present number of members sixty-three.

The following are the officers for 1870: President, Geo. Goundry, Himrods; Secretary, Gilbert D. Baker; Librarian and Treasurer, Wm. W. Buxton, Milo Center.

G. D. BAKER,
Secretary.

Glen Spring, Yates County.

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GOUVERNEUR.

At our last annual meeting, a resolution was passed empowering A. E. Norton, John Bolton and Geo. B. Winslow, to invest the funds of the society then on hand, amounting to $476.96, in the purchase of shares of the fair ground stock.

The committee discharged this duty by purchasing of A. E. Norton, two shares of said stock at $250 each, and the accrued interest, Mr. Norton giving a warranty deed, receiving the funds then on hand, and waiting for the balance until after the fair in September. It may also be proper to state, that the stockholders have executed a lease, giving the society the use of the fair grounds, for a term of ten years from the 3d day of July, 1866; the latter to pay interest, taxes, etc., with the right to purchase at the original cost, at any time before expiration of the lease.

By direction of the president, Mr. Chamberlain, I corresponded with Hon. X. A. Willard, early in June, and engaged him to deliver the annual address during the fair.

The first meeting of the board of managers, was held at the secretary's office, June 12th, at which the premium list was reviewed and completed for 1869. The board directed the fair to be held the week preceding that of the county society.

During the summer additions were built on each of two wings of "Floral Hall," and the whole inclosed in a post and rail fence which was found of great benefit by keeping the grounds around the buildings clear of teams during the fair. There was also erected a shed for stock. There is still a necessity for additional accommodations for stock, and I would recommend the erection of from 150 feet to 200 feet in length of cattle sheds the coming summer.

The eleventh annual fair of this society was held September 8th, 9th and 10th, and by reason of exceeding unfavorable weather during the first two days was continued on the 11th.

Notwithstanding the fears and discouraging predictions of many of our friends, that the fair would prove a failure in consequence of being held so early in a backward season, and the still more discouraging reality of unfavorable weather during the first two days of the fair, yet I think I may be justified in stating, that at no previous exhibition since the organization of this society, has its display in nearly every department been so creditable to exhibitors or gratifying and encouraging to its friends.

The attendance of visitors, though nothing like what fair weather

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would have brought, was doubtless greater than ever before, and the receipts correspondingly larger, though the profits were lessened somewhat by the extra expense attending a four days exhibition.

In class one, Ayrshires, there were forty-four entries. The show in this department gave evidence of the increased interest felt in this breed of animals, and was pronounced by the judges "a credit to any society for dairy cattle," which was indorsed by hundreds of visitors. This department was, perhaps, the leading feature and attraction of the fair.

There were but eight entries of Durhams, owing, it is presumed, to the fact that stock growers in this section are not giving particular attention to this valuable breed of cattle.

Of grades there were fifty-seven entries, all good, and a few very fine specimens of stock. There were thirty-six entries of natives, making, with the single Alderney on exhibition, 158 head of cattle entered for premiums, besides a few entered for exhibition only, probably not less than 170 head all told.

There were 106 entries of horses and colts, comprising upward of 130 animals, most of which were *bona fide* entries, though a few, I fear, still continue the sharp practice of entering their teams ostensibly to compete for premiums, but really to avoid paying the small amount asked for a "carriage card."

I would, however, suggest as a remedy for this evil that a regulation be made requiring all persons driving on the fair grounds with teams to have "carriage cards," those who enter their teams for premiums to be refunded the amount so paid, upon a report of the judges that said persons exhibited animals worthy to compete for premiums, whether awarded premiums or not. A regulation of this kind would protect the society from imposition and work no injustice to honest exhibitors.

The show of sheep was not so large as that of the previous year, and leaves much room for improvement in this particular.

There were thirteen entries of swine of different breeds, all highly commended, and said to be superior to any display in this department in the county.

Of butter, I have to report twenty packages on exhibition, a marked improvement over former years. Some of it was pronounced very fine by the committee. In a few instances the manufacture and flavor were pronounced good; but being over-salted with coarse salt and packed in poor tubs, was spoiled for market use. Although a poor article of butter will not bring a first class price, be the package

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which contains it ever so nicely made, yet there is no doubt but good butter will bring a higher price, both to the producer and dealer, when brought to market in neat looking and well manufactured oaken tubs or pails, and it is for the interest of butter makers to be particular rather as to the quality than the price of tubs they use. I have called attention more particularly to these points at this time for the reason that I learn from undoubted authority that the dealers in New York and Boston, who principally dispose of the butter made in this section, complain of its present average quality, as compared to that of eight to ten years ago. The reason assigned for this is, that many of the butter makers of that day, in consequence of the more recent multiplied facilities for manufacturing cheese, have turned their milk into that commodity, leaving the making of butter to a class of farmers who do not give it the study and attention necessary to the production of a "tip top" article.

There was a very creditable show of cheese both in quality and quantity (fifty-seven in number), most of which was pronounced good and some really excellent by the committee, as well as by the competent writer on this subject who delivered the annual address. What has been done elsewhere in this matter may be and ought to be accomplished here, and will be when our dairymen shall have given the necessary study and care to all the minutiæ of cheese making. I trust that the time is not far distant when it will be unnecessary to brand "Orange county" or "Herkimer county" on packages of butter or cheese sent to market in order to command the highest price.

In the mechanical department there were fifty-seven entries of worthy articles, nearly double the number of last year, mostly agricultural implements. Notwithstanding this increase, there is still much more room for improvement in the number of entries in this department.

In household products, needlework, paintings and drawings there were seventy-four entries, and, although an increase of more than fifty over last year, yet not equal to what the exhibition in this department should be. In paintings and drawings the display was remarkably poor in point of numbers.

In maple sugar, syrups, wines, honey, bread, etc., the show was far from commendable in quantity, though the quality of the few articles entered in this class was excellent.

In class ten, including grain and garden vegetables, there were ninety-seven entries, amounting in bulk to nearly, if not quite as many bushels, and comprised almost everything properly belonging to

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this class, all of superior growth and quality. To many in view of what was generally regarded as an unfavorable season for anything like a respectable display in this department, and especially in view of repeated predictions of anxious friends of the society that the fair would be a failure in consequence thereof, this result was most gratifying, and particularly to those who made some little effort to render these predictions untrue.

In class eleven of poultry, there were fourteen entries, including several fine specimens of the most celebrated varieties of domestic fowls. This hitherto almost neglected department of our fair promises, from the great interest now being manifested throughout the county in the introduction of improved breeds of poultry, to soon become a prominent feature of agricultural exhibitions; for a farm yard will soon be regarded as incompletely stocked that cannot rejoice in well-bred fowls, as well as in pure blooded cattle and horses.

In class twelve, consisting of fruit and flowers, there were forty-seven entries, a large per centage of increase over the entries in this class of former years. This includes in one entry only the sixty odd varieties of apples presented by G. W. Campbell, of Macomb, and does not include the sixteen choice varieties exhibited by Hon. A. B. James, of Ogdensburgh. It has been fully demonstrated that apples and other fruit can be successfully grown here if proper care be taken in selecting the most hardy varieties, and instead of being one of the *least*, this might become one of the *most* attractive departments of our fair.

The practical remarks of Judge James on this subject, at our last fair, are worthy of notice by this society, and will, no doubt, prompt some of those who heard them to at least endeavor to imitate his example in fruit growing.

In the discretionary class there were nearly 150 entries, ranging from fancy articles of the most delicate and finished workmanship to those of coarser make, and more practical utility, or as the committee aptly expressed it, "varying in interest from a lady's collar to a washing machine." Owing to the fact that our premium list does not include many articles presented for exhibition, the entries in this class necessarily grow to unwieldy dimensions, so that it is impossible for the discretionary committee to satisfactorily perform the duties assigned to it without more labor than ought to be asked or expected of one committee, or can conveniently be accomplished in the short time allowed. To remedy this, our premium list should be extended to include every probable entry, and a regulation adopted instructing

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the secretary to assign articles offered for premiums and not named in the published premium list, to the class to which they properly belong, the amount of premium in each case to be determined by the executive officers of the society. Class thirteen, or the discretionary class, might then properly include musical instruments, sewing machines, and such other articles as were difficult to classify.

The annual plowing match was held on the farm of P. D. Woodcock, in the town of Fowler. There were but six entries and a small attendance of spectators. The difficulty experienced in finding suitable grounds in a central locality, the cold, wet weather, which frequently accompanies so late a day in the season, as it seems necessary to select for a "plowing match," should, in view of the expense, unless there is more interest manifested, suggest to this society the propriety of imitating the example of other kindred organizations and discontinuing this appendage to our fairs.

The whole number of entries was largely in excess of any former year, and nearly fifty per cent greater than last year; truly, an evidence of the increased interest in our fairs and the advancement and prosperity of our community.

The annual address was delivered on the 3d day of the fair by Hon. X. A. Willard. The subject, "Dairying" was well chosen for this locality, and the address was eminently practical and instructive, in every way worthy "the man, the subject and the occasion," and was attentively listened to by hundreds of interested, and, it is believed, profited farmers.

There have been purchased since the fair, at an expense of $500, two additional shares of the "fair ground stock" of Chas. Anthony, who has executed a deed for the same, which has been recorded in the county clerk's office, and is now in my possession. The society now owns four shares of the land it occupies, and, by a year or two more of pecuniary success equal to that of the year just past, will be able to "read its title clear" to the balance. Then and not till then will it be safe or judicious to run in debt for costly buildings for exhibitions, however tempting and flattering the idea may be of outshining our more wealthy neighbors in this respect.

G. B. WINSLOW,
Secretary.

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HAMMOND.

The ninth annual show of the Hammond Union Agricultural and Mechanical Society being over, I herewith inclose the result. Days of exhibition, the 29th and 30th of September, and 1st day of October. The elements favored us with fine weather, dry roads, and a large attendance.

Total receipts		$607 76
Paid in premiums	$203 00	
in expenses	203 76	
in improvements	200 00	
		606 76
Balance on hand		$1 00

Amount of indebtedness for improvements on the grounds, $50. The society, during the past year, erected seats with saloons underneath to rent, which cost $250.; and the success of the present year has nearly liquidated the whole amount, leaving only the above indebtedness.

The show of horses was very large and creditable; many very fine horses being on exhibition. Good cattle were also on exhibition, but not so numerous. Sheep and swine were very meager. Fruit was very extensively and very creditably exhibited, and could not easily be beaten in northern New York in quality or numbers. The show of vegetables was good; not so large in numbers, but large growths.

The dairy was well represented; the committee of examination reporting many fine samples of butter and cheese. Other classes were moderately represented until we arrive at the ladies' department, where we find woolen fabrics of every cast and hue; cassimeres, full cloths, flannels plain and fancy, shawls, carpets, coverlets, etc., etc.; also linens and fancy work of many kinds, for which the ladies deserve great credit. The society is in a flourishing condition; the receipts gradually increasing from year to year.

The officers are: President, Geo. Backus, Rossie; Treasurer, Irenus Franklin, Hammond; Secretary, C. A. Wooster, North Hammond.

C. A. WOOSTER,
Secretary.

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HAMILTON.

The undersigned, president and secretary of the Hamilton Agricul tural and Mechanical Association, of the town of Hamilton, county of Madison, State of New York, would respectfully report: That the citizens of the town of Hamilton organized a town agricultural society in the year 1856, and have annually held town fairs for thirteen years last past; that their last annual fair took place at the village of Hamilton, in said county of Madison, on the 22d and 23d days of September, 1869; that the amount of premiums paid by the said society for the year 1869 was $323.50, amount of receipts $600. Total expenditures for the present year, $550. Surplus in hands of treasurer unexpended, $700.

P. O. address East Hamilton, Madison county, N. Y.

J. RICHMOND, *President.*
D. W. USHER, *Secretary.*

HARPERSVILLE.

The eleventh annual fair of the Harpersville Union Agricultural Society was held September 28th and 29th, 1869, on the grounds of the society. The exhibition was large in stock and in all the departments of agriculture, and floral hall was filled to overflowing with every description of ladies' handiwork.

The annual address was delivered by the Hon. Horace Greeley, which was an able one, and listened to with profound attention. He advocated smaller farms and better cultivation, and the farmers of Harpersville and vicinity will profit by his deductions.

The total receipts of the society were $660.15, of which $268 were paid in premiums, $46.29 for printing, $100 to Hon. Horace Greeley for annual address, and $245.86 for repairs to the grounds, and other expenses. The society is out of debt and in a prosperous condition.

The annual meeting was held on the 14th day of December, 1869, and the following officers were elected for the ensuing year: W. L. Mudge, President; S. D. Parsons, Recording Secretary; Martin Ruggles, Treasurer.

S. D. PARSONS,
Secretary.

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HESS ROAD.

We have held our weekly meetings excepting during the very hurrying time and during the heat of the summer, they being generally well attended.

We have discussed the various subjects brought before us as farmers, with much spirit, and in an entertaining manner, and with much benefit to all engaged. As one of the good fruits of our club and its meetings, there has grown up a very neighborly and friendly feeling among our members, and a desire to benefit and assist each other. In fact, our vicinity has become known as the most peaceable and desirable place to live in this whole community, and we try to incite each other only to do that which is right.

Altogether, the influence of our *club* has been "good and only good, and that continually."

J. S. WOODARD,
Secretary.

LENOX.

The annual fair of the Lenox Farmers' and Mechanics' Association was held at Oneida, September 30th, October 1st and 2d, was very largely attended and financially a success.

The show of cattle was not large, but some very good animals were shown; among them the Short-horn of Dr. O. W. Mason, and a herd of Ayrshires from the Oneida community, were worthy of especial mention. In horses, the show of three year old and sucking colts was superior; of single horses, good; in other classes of this stock the show was deficient.

No stallions were exhibited that the judges considered worthy of the society' premiums for horses of all work, the only ones offered, except sweepstakes open to all. Sheep, none; swine, a few good ones; poultry, fair exhibition. The show of grains and vegetables, was as good as is sometimes seen at a State fair.

The association offered liberal premiums for dairy products, open to the State; but manufacturers did not exhibit, principally owing to the fact that factories up to that time had sold their cheese very closely, and those on hand were thought too green for exhibition. The mechanical department would have done credit to any county fair, and was highly praised by visitors. The ladies were on hand with specimens of their taste and skill, some for use, others for adornment; but

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all well wrought, and making a display that was the admiration of all.

The annual address by the Hon. Ellis H. Roberts, of Utica, was delivered on the grounds, and listened to by a large concourse of people.

Here, as almost everywhere, farmers do not as yet wake up to the importance of their profession, and are not as ready to aid our fairs as exhibitors as they should be; but we hope for the day when the tillers of the soil will feel that theirs is the noblest of occupations, and will combine to obtain that recognition they are entitled to, from other professions and occupations. To attain this, I think you and the other officers of the State Society, are laboring with good effect. May success crown their efforts.

Officers for 1870: President, G. L. Walrath; Secretary, E. F. Lewis; Treasurer, T. F. Hand.

E. F. LEWIS,
Secretary.

LITTLE FALLS FARMER'S CLUB.

LITTLE FALLS, *May* 14, 1870.

Corresponding Secretary of the State Agricultural Society:

DEAR SIR.—I forward you to-day the thirteenth annual report of the Little Falls Club. The papers embrace some of the leading discussions before the club during the year. The arrangement of matter and the labor of making the report are due to Hon. Josiah Shull, of Ilion. I trust the papers will be found useful.

I have the honor to be, very respectfully yours, etc.,

X. A. WILLARD,
Secretary.

FARMERS' CLUB OF LITTLE FALLS, HERKIMER COUNTY—DISCUSSION ON THE BENEFITS OF IRRIGATION, FILTRATION, ETC.

The Farmers' Club met at the court-house, in Herkimer, on the 26th of March, 1869, and discussed the subject of the benefits of irrigation.

Mr. S. S. Whitman, of Little Falls, opened the discussion, by saying, that he had not the experience he should have on the subject presented for discussion. He thought the subject worthy of more consideration than was usually given it. That farmers should take advantage of the facilities afforded them, which many times would be of

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great utility. He had frequently noticed, as nearly or quite every observer had, where water had been turned from the highways and flowed over the adjacent meadows, that double the quantity of grass stood on the part flowed than where not. In his own experience, he found where the water had been turned over his meadow, the results were very beneficial. A good plan in farming would be to watch the opportunities for irrigation.

Hon. Harris Lewis said some of his lands had received such an excess of irrigation, in 1867, as to destroy quite a portion of the hay crop on his river flats. The next year, 1868, the grass thickened up so that he had a very heavy crop.

Hon. Ezra Graves, of Herkimer, inquired what kind of soil would receive the greater advantage from irrigation; whether a loose, gravelly soil would be as much or more benefited than one of a more compact, or less impervious nature.

Mr. Lewis thought that loose soils received the greater benefits from irrigation. That the water filtrated, leaving the enriching qualities contained in the water, in the soil.

Mr. Graves said the doctrine was fully illustrated by the process of filtration, as practiced in many cases to clarify water of its impurities. He referred to a filter that he saw offered for sale; that he thought it would be well for persons having wells of hard water, to filter it, to free it of the lime that usually developed itself in tea-kettles. He alluded to a filter made of slats, close together, with an apartment filled with charcoal, which was a perfect filter.

Mr. Lewis would suggest to persons having a well of hard water, that an apartment be constructed by the side of the well, of water lime on all parts except adjacent to the water, and that part be laid up with brick and enough water lime put between the brick, to keep the water from rushing through between the bricks. The water would filter through the brick and be relieved of impurities; that water will readily filter through bricks that were not too hard burned. To purify rain water in a cistern, there should be two apartments, the one to receive the water and the other for the pump to bring up the water purified. On the brick wall of the receiver the impurities would accumulate so that it would become necessary to clear it off at least twice in a year, or the water will not filter through the wall.

Mr. Whitman thought water should not be turned on meadows at a time when the water would be likely to freeze. The low places would fill up and freeze ice, which would be injurious to the grass. If turned on when the weather was mild or warm, the water will

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absorb. He would prefer turning the water on the meadow in the latter part of the day, that through the night the water would become generally absorbed. If turned on in the morning, evaporation would be much greater and the land would be more liable to bake or harden.

Mr. Geo. W. Pine, of Herkimer, had no doubt but if the small streams could be turned on meadows it would be very beneficial. There are times when moisture is deficient, and if springs or water courses could be turned on the land the results would be valuable. He had the opinion that stagnant water would be more valuable than fresh, that it had acquired properties that would be beneficial. Mr. Pine gave a very interesting account of the manner of irrigation in California and Utah, and its necessity and influence in those localities.

DISCUSSION IN REFERENCE TO THE MANAGEMENT AND TREATMENT OF DAIRY STOCK—HOW TO PRODUCE THE BEST RESULTS.

The regular meeting of the Little Falls Farmers' Club, was held at its rooms in Little Falls on Friday afternoon, May 14th. The discussion was opened by Hon. Josiah Shull, of Ilion, who stated the question for consideration. The treatment of dairy stock to produce the best results—and spoke as follows:

As dairying is the leading branch of the business of the farmers of this county, it becomes us to study the subject of the treatment of dairy stock, so as to produce the best results. I consider the farmer as much a professional man as the lawyer, doctor, or member of any other profession, and believe that he requires an equally thorough education and study to enable him properly to discharge the duties of his profession with profit to himself and for the good of the community.

A careful study of an animal will reveal the fact that it possesses a certain degree of intelligence, which will be observed in its recognition of the persons who are in the habit of handling it. If the treatment is kind it will reciprocate by friendly action. If the treatment is harsh and unfriendly, it will exhibit fear and a desire to get from the presence of the person caring for it. Fear creates a certain excitement in the animal which is injurious to its prosperity, and consequently to that of its owner. Quietness, ease and familiarity, aside from plenty of food and water, seem to be very essential elements for the production of increased results.

The food, the quality and the quantity, the time and manner of feeding, requires careful study. It will be admitted that a sufficient quantity and of a good quality is necessary.

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The natural food for dairy stock is grass. It may be in a green state, or may be dried. When taken in a green state it contains a large quantity of water and is of a very nutritious quality. A plentiful quantity of good nutritious grass, and a good supply of fresh spring water, seem to be the essentials to produce the best results, as is apparent to every observing farmer. Yet, in a large number of cases, this requisite is infringed on by overstocking. Especially is this the case when the dairy products command high prices. In the eagerness for gain, in many instances, this essential part of the subject may be overlooked. There is a season of the year when we have pasturage, in which there may seem to be a surplus of feed, and this sometimes leads to the habit of overstocking. My experience is that no more stock should be kept than can be well kept and well cared for. I should prefer fifteen cows well kept, to twenty poorly kept.

In wintering stock, the quality and quantity of feed and the manner of feeding, require our careful attention. For the proper wintering of stock, a comfortable stable with proper ventilation seems to me to be one of the necessary requisites. The temperature of the stable should be kept as even as can conveniently be done. A tight stable and no proper ventilation is unhealthy for the cattle. Where many are kept, a tight stable will become warm and moist, and the air offensive. But where the ventilation is in accordance with the number, it will be very different. When cattle are kept in a stable that is too tight, they will be affected by the cold when turned out to water and exercise, much more than when the air in the stable is kept circulating. It is the practice of many dairymen to turn the stock out of the stable in the morning and leave it out all day, let the weather be as it may. This is a practice that should be discountenanced. When the weather is pleasant and comfortable, it will do very well, but in case of rains or storms, stock should not be left out any longer than shall be necessary to get water. Every dairyman should have proper and convenient places for the stock to water. The practice of long journeys to some creek down in the lot, is one that has prevailed to some extent. If they are to go to the brook, it should be at a convenient distance.

The food for wintering dairy stock is confined principally to hay and corn stalks. I shall say nothing new to this club when I say that the hay should consist of grass dried instead of letting it stand to become hay on the stalk. The practice of curing grass for dairy stock is obtaining, and I think it cannot be too highly commended.

Experiments that I have made in feeding hay made from early cut

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grass and late cutting, has satisfied me that the early cutting is the best for the stock. Stock will eat it up clean, while they will leave a part of that which is about ripe. Place the two kinds before the cattle, and they will readily pick out the early cut grass. There is more weight in the late cutting, but it is not so nutritious; the additional weight being made up of woody fibre of little or no value for food.

The dairy stock should be regularly fed at stated times. At each feeding they should have a sufficient quantity to fully satisfy the appetite. The quantity will vary according to the size of the animal. From seventeen to twenty pounds of good hay is what dairy stock will consume daily.

The practice of feeding varies very much with different dairymen. Some feed twice each day, while others will feed three, four, and even five times a day. I have made inquiries as to feeding in different dairies, and my conclusion is that a dairy fed twice a day (morning and night), have wintered better than when oftener feeding was practiced. When the stock is allowed to make a full meal, they become quiet and enter upon chewing their food, which, as will always be observed in a healthy animal, is done whenever they are not engaged in feeding. The process of chewing and digestion, I think, requires the intervals of two feedings in the twenty-four hours, or one day.

If the stomachs of the animals are continually, or at frequent or irregular intervals, being supplied with additional food, no time is allowed for chewing and proper digestion. Food will be the most beneficial to any animal when it shall be of proper quality and quantity to fully supply the requirements of nature, and allowed a proper time for digestion. Then the stomach becomes prepared to take the next meal.

Mr. Van Valkenburgh followed, and said he had been in the habit in winter of feeding hay twice a day in the stable, and straw in the yard at noon, until last season. He then became convinced that he did not feed often enough, and commenced to feed six or eight times a day. He gave the first feed at about five o'clock in the morning. At about eight o'clock, he fed each cow two quarts of cut potatoes mixed with one quart of meal. The meal was a mixture of corn, oats and middlings. This he fed regularly. He then turned the cows out to water, and if pleasant let them remain out two or three hours; if cold and stormy, but little more than half an hour. After putting up, they were fed light feedings as often as the previous one was eaten up (generally about three feedings); and at about half-

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past three P. M. they were again turned out to drink, and left out until milking time. He fed them upon putting them up at milking time, and fed them again at eight o'clock. No hay was wasted, and his cows never looked better than they do this spring. As a general thing, cows will lose after the commencement of milking, at the rate of about a pound a week. Mine have lost nothing. With thirty cows, and two coming in each week, this keeps the quantity of milk about even. My cows average sixteen pounds of milk per day, after skimming the night's milk. They are all in excellent condition.

Mr. Whitman said, that in his judgment, the feeding of stock, depended much upon the size and age of the cow.

Mr. Skinner inquired if it was thought that cows received any injury from going some distance to drink when the place where they obtained it was a comfortable one. He did not believe that they did. If the drinking place was comfortable, he thought the exercise in going some distance was beneficial. He believed in the prime importance of pure water, and was in favor of giving cows all the food necessary to satisfy their appetite.

Mr. Willard questioned whether stock fed frequently was as healthy as that fed less frequently. It was not in accordance with nature. The cow is provided with four stomachs. The first seems to be a receptacle of food partially chewed. When this stomach is filled she rests, and the food is thrown up, by its heat, into the mouth in the shape of balls, which are again chewed. It then passes into the second stomach without again passing through the first. It then passes through the third and fourth stomachs. All fine food and liquids go immediately into the second stomach; coarse food into the first. One of the advantages of feeding meal with hay is, that it goes into the first stomach, and is thus more thoroughly assimilated. This intricate process would seem to require time, and hence the advantage of not feeding too often.

Mr. Skinner said that cows, when an abundance of water was furnished them, would drink frequently. He thought they should have an abundance of water convenient of access, so that they could be allowed to satisfy the demands of nature.

Mr. Whitman thought that they were inclined to be regular in their habits in reference to drinking.

In reference to the effect of currying cows, an instance was given of a farmer who curried his cows occasionally through the winter. Their condition was greatly improved by the operation, and they came out looking finely in the spring. He thought cows would do as much

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"currying" as possible on their own account. He would furnish them with scratching posts. He would give them a hemlock stock, set in the earth, with projecting limbs, and a pole firmly placed on posts, one being higher than the other, for them to pass under.

Several gentlemen expressed the opinion that sawdust was better than straw for bedding.

In regard to turning cows to pasture, it was thought that the change from grass to hay should not be too sudden. Some members were in favor of turning out as soon as possible, continuing, at the same time, to feed hay as long as required by the cows. Others thought it better to wait until the pasturage afforded a good bite, and then turn the cows in, making the change gradual. The balance of opinion seemed to be in favor of turning out as soon as possible.

Mr. Whitman called attention to the revolution which had taken place in reference to the cutting of hay, and which he believed to have resulted in part from the action of the Little Falls Club. Farmers generally were now in favor of cutting hay early. He asked the opinion of the club as to whether hay thus cut would keep the cows in perfect condition through the winter.

Mr. Van Valkenburgh said that he kept thirty-one cows, and cut his hay as recommended by the club. One of his neighbors kept fifty, and cut it late. His neighbor's cows were in much poorer condition than his, furnishing to the factory only about fifty pounds of milk more than his own.

The question was presented as to whether it was best to have one large pasture or two smaller ones.

Mr. Willard said that his observation led him to believe that it was better to have one large pasture than to alternate from one to another. The feed was more uniform, and the results more satisfactory. It was thought that it would take, in Herkimer county, from one acre and a half to two acres of pasturage to keep one cow. In some very fine pastures, an acre would suffice.

Mr. Van Valkenburgh kept forty-two head of cattle on fifty-five acres.

In reference to the question of fall feeding, it was thought that it was not injurious to feed to a certain extent. It should not be gnawed down close. It was not generally thought profitable to cut an aftermath. The fall growth was an excellent protection against the frosts.

In reference to keeping cows in winter, it was thought that one acre of grass land to a cow was generally sufficient for their winter food. It took more food for old than young cows. Mr. Whitman

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thought that the idea that it cost no more to keep a good cow than a poor one, was fallacious. It took food to make milk; and a good milker required more food than a poor milker.

FENCES AND FENCE BUILDINGS.

The first regular meeting of the Little Falls Farmer's Club for the present season was held at the club rooms in Little Falls, Friday afternoon, November 12th. The president of the club, Hon. Harris Lewis, of Frankfort, announced as the question for consideration "Fences and Fence Building," and called on Mr. Whitman, of Little Falls, to open the discussion.

Mr. Whitman defined the subject as including hedges and all other barriers, for the protection of lands against the encroachments of animals. He thought that the manner of fencing and the material used were undergoing a continued and necessary change. He traced the progress of the art from the time when it made use of logs, through the day of rails to the present day of boards and light stuff. These changes were made necessary by the continually increasing scarcity of lumber. He had himself built a fence of lath, which had served excellently, sufficing to fully protect the garden and fields which it surrounded. He was now intending to use narrow pickets of pine, half an inch in thickness. He thought a fence should be high enough to prevent animals from reaching over, from getting their heads through, or from getting under it. Such a fence, properly built, no matter of what material, would be perfectly satisfactory. We do not fence against the strength of animals. Did they exercise their strength, we could hardly build one strong enough. He regarded a picket fence as the most formidable in appearance, and appearance went as far as strength, and perhaps farther. He would recommend the use of pickets five-eighths of an inch thick, four feet long, and two inches in width. He would put the pickets, ordinarily, four inches apart, or, if desired to keep out hens, three inches apart. The building of a fence like this effects a great saving in material, taking but thirty-three pickets to the rod. The rails are made ten feet in length, two inches wide, and one and a half inches in thickness. He sets the rails with the widest part up and down. His manner of making the fence (which is designed to be portable), is to make the frame for the pickets, and nail them on in the workshop or barn. This is done by laying down the rails at the required distance apart. A false frame (with spaces for laying in the pickets), is laid on top. The pickets are then laid on the rails, the space between them being regulated by

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the pickets of the false frame, and are nailed as fast as laid. The lower end of the pickets are made even by striking against a straight edge attached to the lower side of the false frame as they are put on. The panel is completed by nailing a single narrow strip to give it strength, diagonally from rail to rail, across the back. In nailing on the pickets, he uses five penny nails.

His method of putting the fence up, is to join two sections at a time, as follows: Let the rails of one section overlap the rails of the other lying on top; support the sections, at the right height from the ground, by a block, or bit of plank; then drive on each side of the lapping sections and the supporting block, a stake of about the size of a hand spike; if the fence is designed to be permanent, or to stand in one place for more than one season, fasten the tops of the stakes together with wire; if to remain in the place where put only for a few months, marline (tarred rope) will be cheaper, and answer equally as well. He would advise the use of cedar stakes where possible, on account of their durability. He has used this kind of fence for years, moving it back and forth, and from place to place as often as desired. Never has had any trouble in regard to creatures getting over or under it. For line fences he would, perhaps, prefer something more permanent. He would recommend the fence which he had described, for its cheapness.

In building permanent fences, he had a word to offer, in regard to the manner of digging post holes. He would strike a line and mark off the distance between the posts. Then drive stakes about four inches from the line. Then make the center of the hole opposite the stakes. Then stand facing the line of the fence, and dig a hole slanting from the digger, but perpendicular on every other side. This will enable the digger to lower his spade, so as to bring up full spadesful, and greatly expedite his work, as well as making it easy.

The subject of hedges being next spoken of, Mr. Willard made some remarks in regard to hedges generally, and stated the opinion expressed by the editor of the Germantown *Telegraph*, that no one can afford to have live fences unless they have an abundance of land, as the hedge would occupy a considerable space, and exhaust the vitality of a much larger space on either side of it. He spoke of the annoyance resulting from cattle in the roads, and hoped the time would soon come, when farmers would no more be subjected to it, and would no longer be obliged to support road fences.

Other members of the club indorsed this opinion. An instance was mentioned in which the farmers of an entire neighborhood had

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resolved to do away with road fences, and to protect their lands by enforcing the law. The resolution had been carried out, the highway ran through beautiful fields cultivated up to its very limits, and the roadside was like a continual meadow. These fields were fully protected by enforcing the law, which permits any farmer to impound on his premises and advertise intruding cattle, and recover fines before releasing them.

Mr. Lewis recommended, as the best hedge with which he was acquainted, the Osage orange. His experience with this hedge led him to regard it as an excellent one.

The next speaker was Hon. Josiah Shull, whose remarks were as follows:

Although fences have been of large expense on the farm, yet I have not found an article on the subject, in any of the agricultural reports which I have read. A subject of such vital interest to the farmer should be discussed, and plans and expenses given. Let us learn from those who have had practical experience, what is the most practical, durable and economical fence for the common farm use. What plan should be used, and of what material should it be built, so that it may in every way serve the best purpose, for the amount of the expense. My experience on fencing is somewhat limited, yet I have made many trials with various kinds.

Lands and farms are fenced for the convenience of the occupant, and the protection of crops from stock. It is an exclusiveness which self-interest demands.

As fencing applies to the farm in general, we will consider such kinds as, for durability and expense, best serve the purposes for which they are intended. Stone, lumber, wire and hedge, constitute the principal materials used for the purpose.

Where a farm contains field stone of a proper size for laying into a wall, this material can be used to a good advantage. In estimating the cost, it will be assumed that every good farmer should clear his farm from all such stones as will be a hindrance in plowing and putting in crops. In this case he naturally places them in convenient piles. Instead of piling, he should haul them to a line of fence, which expense will cost extra from piling, say twenty-five cents per cubic yard. Making the fence two feet wide on the bottom, one foot on the top and four feet high, will require three and two-thirds cubic yards to a rod in length. The cost will be as follows:

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For delivering stone for one rod of fence	$0 82
Laying them in wall	75
Making a total cost per rod of	$1 57

When ledge stone can be obtained at not to exceed three miles of hauling distance, the dimensions of the wall being the same as above, the cost per rod, allowing for beaking from quarry, twenty-five cents per cubic yard; for hauling, $1.25 per cubic yard, and for laying in wall, twenty cents per cubic yard, will be as follows:

For breaking ground per rod of fence	82
Hauling and delivering stone	$4 58
Laying in wall	73
Making a total cost per rod of	$6 13

If the ledge be on the farm the cost will be much lessened in expense of hauling, as follows:

For breaking per rod of fence	82
Hauling	$1 64
Laying in wall	73
Making a total cost per rod of	$3 19

To build of wire and of lumber, we would use cedar posts and four strands of wire, with an inch board, six inches wide on top. This makes a very good and durable fence, besides being a protection against stock. If placed along the highways, it allows the wind to carry the snows along without causing drifts in the road. The wire fence is more particularly adapted to use as a barrier against cattle and horses.

To construct wire fences, the posts should not be more than eight feet and three inches apart. The ends or terminating posts should be well set in the ground, so as not to give way when the wires are strained. The remaining or intermediate posts should be firmly placed in the ground, and holes bored through each to run the wire from one end to the other of the section of fence. The end or terminating post should have a pin, with a ratchet and a square head, to wrench or strain the wires. The cost of the fence can be estimated as follows:

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Two cedar posts per rod	$0 50
One six inch board, (8½ feet) 16½ feet long	15
Six ten penny nails	02
Four wires, No. 8, 10 cents per pound	50
Labor for setting posts, boring and wiring per rod	25
Wrenching pins	01
Total per rod	$1 43

To build a substantial and durable fence of lumber, cedar posts and inch hemlock boards should be used. The boards should be sixteen feet long, six inches wide, and four boards to the panel. The posts should be set seven and one-half feet apart; fasten the boards at each end with a seven inch spike and a two and one-half inch slat, resting the boards on the spikes. At the lap use a seven inch spike and at the middle a six inch spike. The lap on each end of the boards should be six inches on the post. The cost at present prices will be as follows:

Two posts, 25 cents each	$0 50
Four hemlock boards, 32 feet at $18 per M	57½
Two slats	04
Four seven inch spikes, (one pound)	06
Four six inch spikes, (one-half pound)	03
Labor to construct	20
Per panel of 16 feet	$1 40½

Reduce the same to rods and we have an expense of $1.54½ per rod.

In regard to the height of this fence, three feet eight inches I regard as sufficient. It has the advantage of not being so liable to be effected by the winds, as that of a greater height. As a barrier for cattle, a fence built of the firmness of one of this character is ample. Any cattle that cannot be turned by such a fence, are too ugly and unruly to be kept on a farm, and are only fit for the shambles.

Hedge is not much used as a common fence. It is used mostly for the sake of ornament. My experience with hedges is rather limited. I have on my place a number of rods of willow hedge on the side of the tow-path bank of the Erie canal. One year ago last spring, I put out fifteen or twenty rods more. My reasons for setting more were, that it will not answer very well for boatmen to tie their lines to, and will not be as easily destroyed as post and wire, or post and board fence; besides it will not answer as well for boatmen to build fires of.

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The expense of setting the cuttings is about twenty-five cents a rod. It takes a number of years to grow a hedge of this kind which will be serviceable. In its growth, it must yearly be cut back so as to thicken the bottom for protective use. The yearly expense of cutting back is about twenty-five cents a rod. It will require five years to become serviceable; and continually from the time of setting, it must have its annual clipping, or it will become too large, and the roots take the strength of the soil. It is not probable that it will become a common farm fence while stone, lumber, iron or wire, can be obtained at present prices.

EXPERIMENTS IN FARMING.

A regular meeting of the Little Falls Farmers' Club, was held at the court-house, in Herkimer, on Friday afternoon, November 26th.

Hon. Harris Lewis opened the discussion. Mr. Lewis stated that when he commenced farming, some twenty years ago, he purchased one cow from a distance and had one which was raised on the farm. The cows were both of the same age, and about the same size, and cost about the same to keep. The cheese made from both went to market together and was sold alike. But the cow raised on the farm would make 700 pounds of cheese during the season, which at prices then would amount to forty-two dollars, while the cow he purchased made but 200 pounds per year, which would sell for only about twelve dollars. The cost of keeping the cows was twenty dollars each per year. The cow he raised, therefore, afforded a profit of twenty-two dollars, and the cow purchased, eight dollars loss. At present prices the cow raised would produce $105 worth of cheese, and the cow bought, thirty dollars worth, making a difference between cows in a season like the last, of seventy-five dollars. He would here add, that almost every dairyman in Herkimer county was, year by year, repeating this experiment.

He had been trying for a long time to persuade dairymen to raise their own stock, and he presented this instance merely as a proof of the superior value of stock raised on the farm where used. To do her best, a cow must be acclimated, then she must become accustomed to the ways of her owner, his habits of feeding, etc., and she must also become accustomed to the pastures where she feeds.

Mr. Putnam indorsed Mr. Lewis' statements as far as Canada cows were concerned. He had had a losing experience with them. He believed that kind treatment had much to do with the condition and value of cows generally. He had lately induced his tenant to use the

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curry-comb, and to treat his cows kindly in other ways, and has since noticed a perceptible increase in milk.

Hon. Josiah Shull gave some interesting facts in regard to experiments in potatoes. He referred to the commercial value of the potato as proven by its extensive use. It ranks as an article of food, second to bread, and may justly be called one of the staffs of life. A hearty meal would be considered incomplete without it. He believed that much of its value depended upon its quality. Potato, like bread or any other food, is valuable according to its quality. Hence it is desirable to obtain potatoes of an excellent quality. He had been led to make some experiments on his own farm for the purpose of obtaining such potatoes. He had found that fine qualities were more liable to rot than coarser ones. He instanced the Peachblow, which he regarded as among the best. This potato was quite liable to rot.

This was also true of the Early Rose, but in a far less degree than the Peachblow. He could not say as to whether his experience was like that of others. He had found that a rich soil, highly manured, would produce the largest crop and the largest potatoes, but not the best as to quality. They would also be more liable to rot.

The quantity of seed was a mooted question. He had experimented in regard to this matter by putting two potatoes of the Calico variety, selected as to quality and size, into hills three feet apart, the potatoes in each hill being six inches apart. Right by the side of these hills, he cut the same kind of potatoes, and selected in the same manner, into four pieces, and put two pieces into a hill. The distances of the hills were the same as before, and the treatment through the season the same. When they were dug, the first hills yielded the same number of bushels as the last ones, thus showing that the same number were obtained in the latter instance from one-fourth the seed. Where the whole potatoes were planted, the vines were more abundant, but less stocky. He tried another experiment, with one potato in a hill (using the Harison), in one row the potato being cut, in the other not. He got a yield more uniform in size, and with fewer small potatoes, where the whole potato was planted. Where the cut potato was planted, he got a larger yield, but more small ones. He also made a further test by putting in cut and uncut potatoes of the Goodrich variety, side by side. He used half the quantity of seed when cut and saw no difference in the yield. He had also experimented in the raising of potatoes, with commercial manures. He used poudrette, plaster and ashes. He used the poudrette at the rate of half a ton to

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the acre, applied in the hill before planting. The plaster and ashes mixed in equal quantities, he applied to another piece, lying side by side with the former. He applied it as the potatoes were coming up, and in about one-half the bulk of the poudrette, half a handful to a hill. The poudrette used at manufacturers' prices, was worth ten dollars, and the plaster and ashes two dollars and twenty cents. He was anxious to ascertain the comparative worth of poudrette. The experiment was conducted carefully, the same variety of potatoes being used on both pieces, and both receiving the same treatment. The result showed an equal yield in both cases. He had also experimented with rotted and unrotted barnyard manure. The potatoes from the plot treated with unrotted manure, seemed to be a little smoother and fairer than those from the other. The manure was applied broadcast, and thoroughly pulverized. He thought the rotted manure, acting quicker, produced a forced and unnatural growth, which accounted for the difference.

Much has been said about mechanical potato diggers. He had never succeeded with horse diggers, and finally tried a hand digger, manufactured at Auburn. He had found this to be a practical machine, and worthy of commendation.

S. S. Whitman thought the subject for discussion wide enough to give full scope for remarks. He referred to the old fashioned farmers who worked on the principle of the one who carried grain to mill with a stone in one end of the bag. This class of men were unwilling to pay out anything for improvements. They never experimented at their own expense. After their neighbors had experimented, and the instrument proved successful then they were ready to buy, if they were unable to borrow. Experimenters in farming matters are the men who have conferred benefits upon the community. We are indebted to them for every improvement in stock, in fruit, in cereals, and in all of the different branches of agriculture. He alluded to one experiment, the success of which he was especially glad to call attention to, in regard to the making of a better quality of cheese. These experiments have wonderfully improved our orchards and fruit. The chief difficulty in experiment making, is that we do not prosecute our work to the end.

He stated that many of his experiments had been most successful as failures. He had tried experiments to relieve his onion beds of maggots, but had not succeeded.

President Lewis recommended salt as an effective remedy for this pest.

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Mr. Whitman stated that he had also been troubled with club-foot. This was on ground where cabbages had been planted for several seasons in succession. He changed, the last season to new ground, and had been very little troubled. He had never detected the action or presence of maggots in cases of club-foot. Some members of the club had been lately troubled with the depredations of a white maggot.

Mr. Shull stated that he had planted cabbages, turnips and sweet corn where rye had been plowed under for green manure. A portion of the rye was plowed under in the fall, and the rest was plowed under in the spring. Where the rye was a foot or more high upon the ground where it was plowed under in the fall, there were produced most marked and excellent results in the growth of crops. The crops raised where it was plowed under in the spring were greatly inferior.

A. Rust, of Herkimer, referred to experiments made in the raising of the "surprise oats." The oats were raised on the farm of N. Rust, near Trenton Falls, and were of excellent quality and of good weight.

It is claimed that less seed of this variety is required to the acre, and that the yield is larger and better than that of any other known variety.

Importance and Profits of Bee Culture.

The discussion at the last meeting of the Little Falls Farmers' Club on the subject of bee culture, was one of the most interesting and profitable that the club has, for a long time, enjoyed.

Mr. M. Quinby, of St. Johnsville, and Capt. J. E. Hetherington, of Cherry Valley, conducted the discussion. Both are men of large experience and wide reputation in bee keeping, and were, therefore, able to speak with authority upon this subject.

The office of the bee, or the part it has in the economy of nature, was the first point taken up by Mr. Quinby. The bee is the chief agent in the fertilization of many vegetable species. Every flower secretes a tiny drop of honey, for no other purpose apparently than to entice the bee thither, that, while gathering its sweet food, it shall convey the pollen to the pistil, and thus fertilize the plant. In this way the bee, intent only on satisfying its own wants, inevitably secures the propagation of the floral species. But the office of this little animal does not rest here. The honey it gathers and stores far exceeds its own necessities. Man has discovered the fact, and the habits of the bee have enabled him to take advantage of it. She dwells in communities; her instincts teach her to hoard up honey as long as it is furnished and

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there is room for storing it, and when new colonies are formed these wait for man to assist in providing a tenement. The time at which man first took advantage of the instinct of the bee to form in clusters when the new colony separates from the parent swarm is not known, though it must have been at an early period. Not until recently, however, was it discovered that bees, if opportunity were given, would store surplus honey.

Formerly, the only method known of getting the honey was that of killing the bees. The method was a costly one; and, moreover, oftentimes resulted in obtaining a poor article. At length, it having been found that bees could be made to store surplus honey, the practice was introduced of placing small boxes (caps) on the top of the hive, in which the honey might be stored, a passage way between them being provided for the bees. Various patent hives were constructed for accomplishing the same end. Nearly all of them failed, from the ignorance of their inventors regarding the natural history of the bee, and from the fact that they originated in a desire to benefit the patentee rather than the bee keeper. The hive best adapted to the storing of surplus honey is the movable comb hive. Each sheet of comb may be taken out as it is filled and the bees will restore it; or the comb may be emptied of its honey by the means of a machine used for that purpose and the empty comb replaced when the bees will have only to fill the cells again, and will not be required to renew the comb. This is found to be a great saving, for bees will store thirty pounds of honey while making one pound of comb. It is estimated that a swarm of bees, if saved the necessity of making comb (as may be done by the use of the movable comb hive), will store upwards of 200 pounds in a favorable season.

The wax of which the comb is made is a secretion of the bee, the same as milk is a secretion of the cow. The bee fills itself with honey and the wax is secreted between the scales on its abdomen. It is detached by the feet of the bee and moulded into the cellular comb. The bee bread is gathered and stored for the food of the young bee.

The discovery that new queens are furnished, when old ones are killed, was made some 200 years ago; but no practical advantage was taken of it until recently. If by any accident the old queen dies, twenty days at the shortest, must elapse before the rearing of young bees can begin again. This is a heavy loss to a swarm, as, during the working season, from one to two thousand bees are hatched, and an equal number die daily. Twenty days would, therefore, seriously weaken

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the strength of the swarm, although the work of storing honey goes on the while without interruption. Some little excitement may be observed for the first day or two after the loss of the queen, but not enough to seriously affect the industry of the swarm. By means of the movable comb hive, this delay may be avoided. A matured queen cell may be introduced into such a hive, and the work of replenishing recommenced after ten or twelve days. Artificial swarming is also easily effected, when the movable comb-hives are used. As soon as signs of swarming are detected in a hive, a portion of the comb sheets may be removed to a new hive. In the hive where the old queen remains, the queen cells, which are easily found, should be destroyed. In the other hive they should be allowed to remain. Let the old hive then be moved a little to one side of its former position, and the new hive placed a little to the other side. When the bees return, they will seek the old place, and not finding the hive there, they will divide about equally between the old and new hives. After a swarm has been once divided in this way, it can be prevented from swarming again by destroying the queen cells, whenever any inclination to swarm is detected.

It often happens that some swarms will not store honey sufficient to last them until spring, and artificial feeding must be resorted to. The best time to feed them is in the fall. They will, at that season, seal up the honey provide for them in the cells of the comb. Swarms, with sufficient stores, may be wintered out of doors. If, however, there is scarcity of stores, and feeding has been postponed until winter, they require a warm place. Bees collect in clusters during cold weather, for mutual warmth, and they will not leave these clusters and travel over frosty comb to obtain honey which may be provided for them, but will remain in the clusters and starve. If the bees to be fed are in box hives, the hives should be turned bottom upwards. The honey or syrup may then be placed in shallow dishes upon the top. If the bees are in movable comb-hives, an entirely different process must be used. Mr. Quinby had found the following method a good one: He dissolved sugar, at the rate of from four to eight pounds of white crushed, in a quart of water, scalded it slightly, and put in a little cream of tartar to keep it from graining again. This sirup he introduced into the cells of the comb sheets, by dropping from the distance of a few feet through a perforated pan. When one side is filled in this way, the comb is reversed and the other side filled, the atmospheric pressure retaining the liquid in the cells of the under side. Enough can be supplied in this way at one time for the entire winter.

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Honey is considered preferable to sirup if it can be obtained in a pure and healthy state.

An estimate was made by Mr. Quinby of the quantity of honey that might be obtained in this State. The amount of honey shipped from the stations of Herkimer, Little Falls, St. Johnsville and Canajoharie, during the year 1868, was about 90,000 pounds. This honey was gathered from an area of about 400 square miles, and was not, in his judgment, one-tenth that could be obtained in that region. Taking this as a basis, 50,000,000 pounds might be obtained in the whole State. At twenty-five cents per pound $12,500,000 would be realized from this article. Mr. Quinby read statistics of the honey produced in various European countries, showing that his estimate was below rather than above the correct figures.

At the close of Mr. Quinby's remarks, Capt. J. E. Hetherington, of Cherry Valley, was called on to give his method of treating bees. He had used straw hives chiefly, because he had found that bees winter much better in them out of doors, than in board hives in the cellar. This is owing to the fact that straw is a non-conductor of cold, while it is a good conductor of moisture. The great objection to using the old fashioned straw hives, is the difficulty attending artificial swarming by means of them. For this reason, he intends to change his swarms next season to movable comb hives, which are lined with straw. He had, however, practiced artificial swarming while using the old fashioned straw and box hives, and with very good success. As it is one which requires too much ingenuity, patience and care, to be successfully adopted by the majority of bee-keepers, we will not give it here. If our readers wish to practice artificial swarming, and every bee-keeper should, we recommend to them the movable comb hive, which is easily made and upon which there is no patent.

During the year 1868, Mr. Hetherington sent to market upward of 21,500 pounds of honey, the largest amount ever sent to market by one man, of his own production, in a single year. He had 450 swarms in the spring, and closed the season of that year with about 900.

Both he and Mr. Quinby united in calling the past year the poorest one for bee-keeping they had ever known. Mr. Quinby said he had swarms that were starving as early as the 10th of September.

At the close of the discussion, the club extended to Messrs. Quinby and Hetherington a vote of thanks for the valuable information imparted by them.

The following resolution was adopted by the club, as expressive of its sense on the subject of bee culture:

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Whereas, The amount of honey annually lost for the want of a sufficient number of colonies of the honey bee to collect it, being enormous, therefore

Resolved, That the subject of bee-keeping is worthy of the careful study of every family in the rural districts in our land; and that some measures should be taken to impart a proper education, either by establishing a professorship in some institution of learning, or by establishing a place of instruction elsewhere, so as to meet the necessities of the case.

At a meeting of the club, on the 28th of January, the discussion of "Fruit Culture" was continued from the last meeting. Mr. M. Quinby, of St. Johnsville, gave the results of his experiments in grafting. He had found from frequent trials, that it was unnecessary that the graft be set in a certain position, or that the end which is set into the stock be whittled to a certain shape, as was the common opinion, in order to induce a circulation of sap from the stock to the graft. If the pores of the graft be brought into near (not necessarily immediate) connection with those of the stock by insertion, and the wax be thoroughly applied, so that no air can get into the split of the stock, circulation must take place.

The best time for setting grafts is when the trees are in blossom. He had set more than 50,000 grafts, and those set at this period of the year, uniformly attained the most satisfactory growth. If they are put in earlier, before the sap begins to flow freely to the limbs, numerous shoots will spring out at the root of the graft and rob it of much of the nourishment it requires during the season. But if set later, after the flood tide of sap has passed, much less will collect at the point where the graft is inserted, and fewer shoots will be formed. If it were desired to change the entire top of the tree by grafting, he should advise that the cutting of the top and setting of the grafts be finished in one year and not gradually. The new fruit is sooner obtained, and no harm is done the tree, if enough of the smaller and lower limbs be allowed to remain to furnish an outlet for the sap from the roots. The sprouts also should be allowed to grow the first year. Fruit may be obtained in this way in considerable quantities, the fifth year. He doubted the assertion sometimes made, that the quality of the fruit of the stock had any influence on the flavor of grafted fruit. He had the Sweet Bough grafted on a hard, mean, sour stock, and some of the fruit were the finest specimens he had ever seen; others, from the same grafts and on the same stock were poor. The graft always and alone determines the fruit, even when set on grafts. His Baldwins, set on Paradise stock, grew much larger

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than the same apple on standards. Moreover, the dwarfs come into bearing earlier, and are more easily picked. They are shorter lived than the standards; but in setting his orchard the standards are set fourteen feet distant one way and eighteen the other, and the dwarfs are placed between the standards in the eighteen feet rows. The standards will not need all the room until the dwarfs die, and by this method he thinks the dwarfs are made to pay well. Grafts for setting should be cut in February, or early in March, and placed on the cellar bottom with the larger ends placed in sand or loose dirt to keep them moist. The temperature should not be above forty degrees. Thus they may be kept until July. He had set grafts in July, and had them grow finely.

Mr. Lewis was of the opinion that the stock did make some difference in the flavor of the grafted fruit. The Bartlett grown on the quince seemed to him more delicate than when grown on other stocks. Most of the members, however, had been unable to deteet any difference.

The subject of grapes was next taken up, and many valuable suggestions made concerning the methods of culture. We only state the opinion of the members of the club regarding the different varieties. The Logan was said to be the earliest, and the Hartford Prolific next. The Concord nearly always ripens and bears well. It seemed a great favorite, also the Isabella. The Delaware and Diana were considered not so well adapted to this locality. The discussion of the varieties and culture of raspberries and strawberries was also interesting.

Messrs. Shull, Quinby and Spinner presented for the inspection of the club several fine varieties of apples and pears. All were thoroughly tested, and were declared (if the commendable zest with which they were disposed of could be taken as a declaration), very good. One variety, presented by Mr. Spinner, has an interesting history. It is called the Middling. The original tree was brought from Schoharie county soon after the revolution, and planted on the line of Doxtater and Bellinger's farms, and from its situation derived its name. The apple is a whitish, long, fair one, slightly tart, and of a rich and delicate flavor, and brings a high price in market.

Mr. Shull said the apple stood first on the list of fruits for general use The varieties that can be successfully grown in this locality are quite limited. The Hubbardston, Nonesuch, Greening, Baldwin and Northern Spy, succeed best as winter apples. For summer and fall use the Red Astrachan; June eating, Sweet Bough, Fall Strawberry and Pound Sweet. He considered it a useless undertaking to try to

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raise too many varieties. The Spitzenberg is a favorite, but the uncertainty of getting apples is becoming so much that he would not recommend them. He thinks it essential to first observe, which varieties succeed best in the locality. In different localities different results are obtained.

At the meeting of the club at Little Falls, on March 10th, the officers of the last year were re-elected as follows: President, Hon. Harris Lewis, of Frankfort; Vice-President, R. D. Brown, of Little Falls; Secretary, X. A. Willard, of Little Falls; Librarian, S. S. Whitman; Treasurer, Hon. Josiah Shull, of Ilion; Directors, Hon. Wm. I. Skinner, of Little Falls, and George W. Pine, of Herkimer.

In accordance with notice previously given, Mr. Whitman presented an amendment to the constitution, requiring of each member of the club the payment of an annual due of fifty cents, in order to continue his membership.

All preliminary business being disposed of, the regular discussion on the subject of "Root Culture" was opened by Mr. Whitman. He was aware, he said, that it was the prevalent idea among farmers, that at the present high price of labor, roots could not be profitably grown. Machinery is employed comparatively little in cultivating this crop. The work, incident to its cultivation, however, he thought might be done at odd intervals, and thus the cost be made less than is generally supposed. After all, the profits of root raising would depend on the selection and preparation of the land, the fertilizers used and the method of their application, the choice of seed, the cultivation, harvesting and subsequent care of the crop, and the manner of feeding. He had raised carrots and turnips chiefly. With mangold wurtzels, he was somewhat familiar, but not at all with the sugar beet; although he was disposed to consider the latter variety favorably, and could strongly recommend the mangolds as easier of tillage than the carrot, and surer of growth than the turnip. He raised carrots for feeding his horses, and had found them very valuable in case of a short oat crop. His usual manner of feeding was a peck of cut carrots once a day. As a supplement to hay and grain he considered carrots nearly as valuable as oats, though not when fed alone. They give tone to the system, keeping the animal in good health and heart. From actual experiment, he had been led to believe that carrots were inferior to turnips in producing a flow of milk. He was, therefore, accustomed to feed his milch cows, and ewes with lamb, with turnips. A half bushel of these roots once a day, he thought a fair mess for a cow; but as this would produce an abundant flow of milk, he consi-

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dered the feeding of middlings once a day necessary to keep the cow in flesh. In the cultivantion of carrots, the quality and condition of the land, is the most important item. If the ground is full of weeds, the crop will cost more than it is worth. The best method of preparing land for carrots, he thought, was to turn green-sward without manuring and plant potatoes. The next year, manure heavily, and set to cabbage. If this crop is thoroughly cultivated, the ground will be free from weeds and still be rich enough to raise carrots the following year without more manure. If artificial manure, or any kind free from seeds, was used, the crop might be raised on the same land for a succession of years. He planted carrots in drills two feet apart, that he might use a horse hoe between them; and the plants he thinned out to five inches apart in the rows. He estimated his average yield of carrots at 800 or 1,000 bushels to the acre, but was not able to state their cost. The sweet German turnip was the variety of this root that he had usually grown. He had chosen this because the best would sell in market for from eighty cents to one dollar per bushel, while those not fit for marketing could be fed to stock.

Mr. Shull, at the close of Mr. Whitman's remarks, gave his experience in raising turnips and mangolds. Carrots, he believed, cost too much to be profitable. The mangolds could be cultivated with half the labor requisite to the cultivation of carrots. A suitable soil was essential to the successful culture of both mangolds and turnips. In a clay or damp soil they would be stunted and watery. Both require a loose mellow soil. Upon such land, they are easily raised. The Swedish turnip, especially, required then but little labor for its successful culture. He planted in drills three feet apart, thinning out to eight or ten inches in the rows. A common cultivator could then be used, and the amount of work to be done with the hand-hoe was thus rendered but slight. If the land was strong, the leaves would nearly cover the ground, with the plants at this distance apart. The largest turnips he had ever raised weighed from nine to ten pounds. An average yield with him was 400 bushels to the acre. The cost of the crop, including the interest on the value of the land, the manure, and the labor of cultivating and harvesting, was very nearly twenty cents per bushels; while he estimated their value for feeding at fully twenty-five cents per bushels. Mr. Shull then read some statistics which he had collected of the yield and cost of roots elsewhere. Twenty-eight to thirty-three tons of Swedish turnips were said to be an average yield in England; while in Scotland it was from fourteen and one-half to eighteen tons; and in Ireland the average yield for a series of

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years, was but thirteen and one-half tons. The Scotch cultivate in ridges twenty-seven inches apart, with the plants from ten to fifteen inches apart in the rows. In most of the States the average yield is from 400 to 800 bushels. Mr. Browdie, however, states he has raised 1,510 bushels from an acre, and at a cost of two cents and seven mills per bushels. The cost of manure and hire of land were not reckoned in this estimate. According to a late report of the Department of Agriculture, the average yield is, of Swedes, 385 bushels; of mangolds, 565. Richard S. Fay, of Massachusetts, values 100 pounds of hay equal to 359 pounds of mangolds, or 504 pounds of common turnips, or 276 pounds of carrots, or 308 pounds of Swedes. Mr. Leavitt, of New Hampshire, gives it as his experience that in raising mangolds the more manure used, the larger will be the roots. He sows early in May, at the rate of four pounds of seed to the acre, and his average yield is 800 bushels of mangolds and turnips. Swedes he considers most valuable, and the seed of these he sows early in June, at the rate of one pound to the acre, in drills two feet apart, thinning to one foot apart in the rows. He uses wood ashes on the young plants to keep off the fly.

Mr. Brown asked if anything would be gained by steaming roots. Mr. Lewis thought not, being of the opinion that the cost of steaming would be greater than the enhanced value of the roots by the process.

Mr. Willard, alluding to Mr. Whitman's estimate of the value of carrots when fed in connection with hay and grain, agreed with him and thought the explanation of the fact would be found in the large amount of pectic acid contained in the carrot. This gelatinizes the other food and renders it more easily assimilated. He said that in Vermont, the American Improved Imperial beet was preferred to all other roots. It was found to be more productive and more nutritious. He had seen specimens raised by Hon. Henry Lane, of Addison county, Vt ., that weighed twenty pounds each. The average weight was from four to eight pounds. They are solid, brittle and keep well. They are easily raised and do best on clay soil, or a clay loam, though it must be free from standing water. Mr. Lane's method of cultivation was to manure at the rate of twenty-five loads to the acre, half of it being plowed in, and half spread on top, the manure being rotted and mellow. In this way the roots may be raised on the same ground for a succession of years. His seed was put in as early in the spring as possible, and was planted in low, flat ridges, as he considered this cheaper than drilling. The rows were two feet apart, the plants being half that distance in the rows. With single roots at this

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distance, and at four pounds per root, an acre would yield seventeen tons. But the ordinary average yield in Addison county was said by Mr. Lane, to be from twenty-eight to thirty-two tons. The entire cost of raising was but eight cents per bushel.

It was evident from the discussion that the members of the club were agreed as to the great importance and value of the root crop to all farmers, and especially to dairymen.

By way of supplement to the above discussion, we present an article on the same subject, contributed to the *Practical Farmer*, by Mr. R. Gibson, the manager of Messrs. Walcott and Campbell's stock farm, near New York Mills. He says:

"We raised about 15,000 bushels of roots last year, about one-fourth of that quantity being Swedish turnips, one-fourth mammoth long red, and one-half yellow globe, and intermediate mangold wurtzel.

"During the fall the plots where the roots were grown were well cultivated, or scuffled, with a three-horse cultivator, harrowed, etc., making a nice tilth; my object being to cause the seeds of all weeds lying near the surface to germinate. It was then well plowed; again rolling and harrowing, making another fine-seed bed. By these means we dispose of two crops of weeds in the fall; during the winter, manure is applied direct from the barn and spread on the surface. In the spring, sometimes I loosen up the soil by running through the cultivator two or three times, but if found necessary to plow, do it early. Experience has taught me not to plow late in the season until the time for sowing the seed.

"If you do not prepare your soil for the crop in the fall, repeated plowings have to be resorted to in the spring, when by continually turning under the dry surface-soil and exposing the damp from below, the moisture will be evaporated; endeavor to keep all the natural moisture in the soil, so that when the seed is deposited it germinates quickly and vigorously.

"Sometimes, for mangolds, if the soil is clean, I have ridged in the fall, but generally delay until the time for sowing, say about May 15th, or as early as the soil is in a fit state to receive the seed; drill about six pounds seed per acre in drills or ridges twenty-seven inches apart.

"Turnips (Swedes), I generally drill about the beginning of June, with two and one-half to three pounds per acre. An extra fifty cents for seed has often saved me a crop; sow enough for a plant and the fly too.

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"Horse-hoe early and frequently; when the plants are large enough they are hand-hoed and singled, leaving the plants not less than twelve inches apart in the row. Mangolds may be allowed still more space.

"Artificial manures I generally use to give the young plant a start, but I place the greatest reliance on plenty of good barn-yard dung; it contains all the elements we require. Some seasons, the last for instance, I could not see that the artificial manure used (superphosphate of lime) did the least good. Still, for turnips, I should recommend that a little be applied to force along the young plant at the most critical period of growth, until the rough leaves appear, when it is out of danger of the fly.

"The mammoth red produces the heaviest crops, especially on deep, rich soils; but I do not think it keeps as well during the spring and summer as the globes. When I speak of summer, I would here say that we had sound mangolds in the cellar last November, when we commenced harvesting the next season's crop. It may seem foolish to grow mangolds to keep in a cellar all winter, and feed the following summer; but I have an object in doing so, and they answer my purpose.

"The intermediate is a new variety, and a very smooth, handsome root it is, keeping well and yielding best after the mammoth. Where the latter grew, I selected the best patch I could find in the field, had two square rods measured off, the produce weighed, and the yield was at the rate of 2,030 bushels of sixty pounds, per acre.

"The turnip crop would not yield more than 800 bushels per acre; but the whole of the root crop averaged a little over 1,000 bushels, of sixty pounds, to the acre, costing between six and six and a half cents per bushel delivered in the barn cellar. We are now feeding from one-half to one bushel a head per day.

"I do not advocate the root crop to take the place of hay or grain in the economy of the farm; but in connection with them, I believe the animals fed on roots are not only more healthy, but also able to assimilate more nutritive material from a given quantity of dry food than they are from that food if not fed in connection with roots, or artificially prepared, as by steaming, etc."

MANLIUS AND POMPEY.

The receipts and expenditures of the Manlius and Pompey Agricultural and Industrial Association for the year ending January 18, 1870, were as follows:

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RECEIPTS.

Balance on hand from the preceding year....	$106 77	
Appropriation from the State for 1868.....	99 45	
Appropriation from the State for 1869.....	82 87	
All other sources.....	875 45	
		$1,164 54

EXPENDITURES.

Paid on premiums awarded in 1868.....	$74 75	
Paid on premiums awarded in 1869.....	279 50	
Other expenses.....	387 37	
		741 62
Leaving balance on hand.....		$422 92

WILLIAM MANLIUS SMITH,
Secretary.

MORAVIA.

The twelfth annual fair and cattle show of the Moravia Agricultural Society was held on the grounds of the society, Wednesday and Thursday, September 29th and 30th, 1869. The grounds have been leased by the society for a term of years, and consist of about eight acres, inclosed by a high board fence, are level and shady, and contain a well graded half mile track. Until two years ago, floral hall has amply accommodated the society, but since that time it has proved far too small, and the result is that want of space compels close packing to such an extent, that visitors are made uncomfortable, articles cannot be properly exhibited, and committee men find it impossible to perform their duties satisfactorily, either to themselves or to exhibitors.

There are also on the grounds a good judge's stand, offices for secretary and treasurer, and a victualling hall.

At an early hour the streets of the village were crowded with men, teams, horses, cattle, stock, and implements of all kinds, finding their way to the grounds, which, before noon, had increased to a throng. Next year we surmise that our accommodations will be put to the severest test; the crowd greater, and exhibition larger; for then we shall have in complete working order, our Southern Central railroad.

Of single horses there were forty, comprising some of the best ever exhibited at our fairs.

Thirty colts were entered for premiums, and many of these were worthy of particular mention, not only for what they were, but for

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what they gave good promise of being. In the matter of breeding and training horses, our farmers have made rapid improvements for a few years, as fully appeared at this fair. Mules, also, are coming somewhat into use for farm working in this section, and several good specimens were shown.

The exhibition of one and two year old calves, bullocks and heifers, was an honor to our stock-raising farmers.

Mr. Webb J. Greenfield, of Moravia, had the best herd of cattle, and was awarded a twenty-five dollar premium therefor, and Harvey Harris, Esq., of Locke, received the twenty-five dollar premium for the best string of working oxen from any town.

The show of fat oxen and working cattle surpassed that of any previous year.

The leading exhibitors of American Merino sheep were J. H. Earl, of Skaneateles, A. N. Chamberlain, of Niles, and Fred. Hunt, of Moravia. Mr. Earl received the special premium of twenty-five dollars. Mr. H. Hand had on exhibition a beautiful Merino buck, for which he paid $1,000. He was admired by every sheep fancier. Long and coarse wool-sheep were well represented by both native and imported specimens, and competition was warm and spirited. The swine pens showed samples of superior breeding. Fowls were rather neglected, although a few coops served to show that we can boast of first rate "blood" in this direction. Southern Cayuga is specially adapted to cheese and butter making, as several samples of both of No. 1 quality well attested. The Moravia cheese factory carried off the first premium on cheese.

In floral hall were displayed, in great profusion, all the fruits, apples, pears, peaches, plums, grapes and quinces, and numberless vegetables. Interest in the cultivation of fruits and vegetables hereabouts is evidently deepening. Flowers were there in rich abundance, thanks to the ladies of Moravia and vicinity. In farm implements we had great variety and excellence. There was a very fine display of carriages. The department of domestic manufacture was filled to the brim. The ladies exhibiting great interest in the awards therein, as well as in the prosperity of the society generally.

The second day was devoted to the exhibition of horses in harness, and to the trial of their speed, and resulted satisfactorily to all concerned. Afterward the president announced the premiums awarded, and so closed the twelfth annual fair.

The fine weather, the absence of accident or mishaps of any sort, the large concourse of people, the greatly increased number of articles

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entered for premiums, the largeness of money receipts (which latter will enable the society to improve their accommodations and increase the premium list for another year), were most satisfactory to the management, as evidences of the appreciation and success of their endeavors.

The annual meeting for the election of officers was held at their agricultural rooms in Moravia, January 18th, 1870, and the following officers were duly elected for the ensuing year: Elondo Greenfield, President; M. K. Alley, Secretary; M. L. Everson, Treasurer.

Cash on hand from 1868	$813 20
Receipts from annual fair, 1869	1,139 99
Amounting to cash on hand	$1,953 19
Expenditures at annual fair, 1869	851 00
Balance in hand of treasurer	$1,102 19

M. K. ALLEY,
Secretary.

NORTH BAY.

Funds in treasurer's hands December, 1868	$39 72
Receipts of fair 1869	397 24
	$436 96
Expenses and premiums	294 23
Balance in treasurer's hands	$142 73

The fair was well attended. The books were received and distributed.

FRANK NOBLE,
Secretary.

ONONDAGA.

The Farmers and Mechanics' Club of the town of Onondaga, county of Onondaga, herewith submits its second annual report:

The whole amount of moneys received by the club during the year 1869, from all sources, including a balance of three dollars and seventy-four cents ($3.74) on hand at the last annual report, was ninety dollars and seventy-four cents ($90.74); annual membership, fifty cents each; and the disbursements for the same period were eighty-five dollars and sixty-three cents ($85.63), for the following objects viz.;

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On account of rent of room, eleven dollars ($11); expense at the annual fair, twenty-one dollars and eighty cents ($21.80); printing, paper and postage, eighteen dollars and fifty-eight cents ($18.58), paid sundries, indebteness of club thirty dollars ($30); miscellaneous, four dollars and twenty-five cents ($4.25); on hand this day, five dollars and eleven cents ($5.11); ninety dollars and seventy-four cents ($90.74).

On the 3d day of June the club held, at Onondaga Valley, a trial of plows with a view of testing their qualities for work, etc. This trial was very well attended and called together a good number of farmers, with several varieties of plows which are held in good repute in this locality. On the first day of July, this club invited an exhibition and trial of mowing and reaping machines, and other farm implements. This exhibition and trial was largely attended by those desirous of seeing the working of the various machines side by side and at the same time, and was a source of gratification to a large number. Besides mowing and reaping machines, there were also exhibited the various patents of horse rakes and hay forks, all of which were put into practical operation and attracted much attention.

The club did not take any final action on the report, though the committee were nearly unanimous in their conclusion. It was discussed through several sittings of the club, and such was the diversity of opinion of the members, that a majority were unwilling to approve of it, concluding the better course would be to let every one present and witnessing the trial, judge for himself as to the best machine.

On the 7th and 8th days of October, the club held its second fair at Onondaga Valley. Both days were fair and pleasant, and the attendance very large, and much interest and satisfaction manifested. The exhibition, in all its various departments of interest and value to the farmer, as well as to all others, was all the club hoped for and exceeded our highest expectations, and we cannot doubt the effect was beneficial.

This club has maintained weekly meetings of its members during the last year, for the discussion of subjects pertaining to agriculture and the interests of the farmer; and we have also a library of over 100 volumes, and additions have been made thereto during the past year.

The following are the officers for the ensuing year: Luke Wells, President; H. Conklin, Secretary; C. C. Warlett, Treasurer.

H. CONKLIN,
Secretary,

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OSWEGO FALLS.

The annual exhibition was held at Oswego Falls, on the 21st, 22d and 23d days of September, 1869.

The receipts of the society from all sources during the year 1869, were	$3,014 10
The whole disbursements, including miscellaneous expenses and premiums during the year, were	2,089 17
Leaving on hand unappropriated the sum of	$924 93
The balance in the treasury at the end of the fiscal year, being the surplus of previous years, was	1,105 29
Total assets of the society	$2,030 22
The liabilities of the society being premiums, etc., uncalled for at the end of the fiscal year 1869, were	$64 50

CHAS. R. SMITH,
Secretary.

February 5th, 1870.

OTEGO.

In transmitting to you the first annual report of the Citizens' Agricultural Society of Otego, it may not be out of place to give a history of its organization. On the 16th day of January, 1869, a few farmers and business men of our town met, to try and devise some way to improve the agricultural interests of our community, and especially of our own citizens. After due consideration it was resolved to form a society for the promotion of agriculture in all its branches. In framing our constitution we were guided by the one under which the State Society now acts, so modifying it as to meet our wants. The members of the society are of two classes, stock members and annual members.

The stock members are composed of such of our citizens and friends from other towns, as subscribe to the fund raised to rent, fence and fit suitable grounds for holding annual exhibitions. The amount of said stock was fixed at 150 shares at ten dollars per share; $1,500 in all. It was taken freely by all classes; the banker, merchant, mechanic, landlord and farmer, are all interested by subscriptions from one to fifteen shares each, and are entitled to elect trustees for the care and superintendence of the grounds and all things pertaining thereto.

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The annual members are those who shall pay annually into the treasury of the society, not less than one dollar; any person, wherever resident, can become a member of the society.

We held our first fair, September 9th and 10th, earlier than we should; but so as not to conflict with other societies, we held it thus early. The first day was devoted to entries and the arrangement of stock and articles. The second to the awards by the judges, and a general exhibition.

The show of cattle was good, the entries were large, with some very fine animals. In horses we had a very fine show indeed; some superior animals calling forth praise from all lovers of that useful beast.

Sheep and swine were represented well, both in quantity and quality, considering that this is a dairy county. The show of fruits and vegetables was not large, owing to the early time of holding the fair. Mechancis and manufacturers also contributed to the interest of the exhibition.

The ladies' department was filled to exceed the highest expectation with things useful and ornamental and of exquisite workmanship. All seemed anxious to do something to make the first fair of the society one long to be remembered.

Owing to a drizzling rain, which continued all of the first day of the fair, the attendance was not large, although the receipts were quite satisfactory. The morning of the second day was more pleasant, and by 10 o'clock the grounds were well filled.

The address was delivered by John T. Mygatt, Esq., of Binghamton. It was highly instructive and common sense in all its points, but owing to a heavy shower and the denseness of the crowd in the tent at the time of the delivery, there were but comparatively few that could hear. Mr. Mygatt kindly consented to have it published in our local paper.

Feeling that the transactions of the society have very much increased the interest of our citizens in improving stock and agriculture generally, we can truly say that our efforts for the past year have been crowned with success.

Number of entries at fair, 1869	575
Number in different classes of cattle	140
Number in different classes of horses	100
All other entries	335
Amount received from membership, entries, fees, admission, etc., at fair	$850 83

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Amount paid in premiums	$600 00
Expenses	225 00
	$825 00

Officers for 1870: President, R. Day; Secretary, C. S. Williams; Treasurer, L. E. Bowe.

C. S. WILLIAMS,
Secretary.

OTISCO.

The Otisco Farmers' Club would most respectfully report that they are in a prosperous condition, having held weekly meetings the most of the time during the winter season for lectures, essays and discussions, in which members and others were interested; we have embraced a wide range of subjects pertinent to our calling, and they have been considered with interest.

The financial condition of the club as per treasurer's report is as follows:

Total receipts during the last year	$177 26
Total amount paid out	122 85
Balance on hand January 1, 1870	$54 41

The library has been enlarged by the receipt of a number of volumes during the year, mostly composed of agricultural books and reports.

The annual meeting of the club was held at their agricultural hall in the village of Amber, January 3d, and the following persons elected as officers for the ensuing year: Charles E. Niles, President; James L. Niles, Recording Secretary; George D. Bishop, Corresponding Secretary; James H. Redway, Treasurer.

The crops in this locality for the year past have been very productive. The dairy, which is somewhat extensive in this locality, has yielded a large product, some above the average, and in the grain district the farmers have been bountifully rewarded for their labors. Winter wheat, large growth of straw and average yield of grain. Barley an increase of acreage sown and yield above the average per acre. Oats large, straw and grain, from thirty to eighty bushels per acre. Corn light. Potatoes good, mostly sound. The hay crop unusually large.

JAMES H. REDWAY,
Treasurer.

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POMFRET.

At the last annual meeting of the Farmers' and Gardeners' Club of Pomfret, held in the village of Fredonia, January 17th, 1870, the following officers were duly elected for the current year (1870): President. Ira Porter, Fredonia; Secretary, Treasurer and Librarian, Almond Z. Madison, Fredonia.

The number of members about ninety, the same as last reported, virtually, though several have not renewed for 1870 by payment.

Meetings, now, second and fourth Mondays of each month, with extras, at school-houses two miles and four miles from Fredonia, the residence of the assistant secretary, Nichols.

The journal of the New York State Agricultural Society, has been regularly received for several months; also, some other pamphlets occasionally, and on July 30th, 1869, a box of books, Transactions New York State Agricultural Society 1867, and of American Institute 1867. For which the club tenders thanks.

A. Z. MADISON,
Secretary.

RUSHVILLE.

The Rushville Union Agricultural Society comprises the towns of Potter and Middlesex in the county of Yates, and the town of Gorham in the county of Ontario, and was organized in February, 1855. The grounds, purchased for its use, contain five acres of land situate within the corporate limits of the village of Rushville, and in the town of Potter, Yates county, upon which a large building is erected; these are valuable premises, and belong to the society, wholly free from encumbrance or debt. An annual fair has been held by the society since the first year of its organizatton.

The report of the treasurer for the year ending January 13th, 1869, shows a balance, over all indebtedness, in his hands of,		$552 96
Amount received at last annual fair, September 30th and October 1st, 1869		461 48
Amount received for rent of buildings and grounds		29 00
		$1,043 44
Disbursements for the year ending January 12, 1870;		
Paid premiums	$301 75	
Other expenses: stationery, nails and sundries	112 30	
		414 05
Balance in hands of treasurer, January 12th, 1870		$629 39

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January 12th 1870, society held its annual winter meeting for the election of officers, etc. The following persons were by ballot chosen officers of the society for the ensuing year, viz.: President, Charles M. Hicks, of Gorham; Corresponding Secretary, N. H. Greene, of Rushville; Treasurer, J. D. Bryant, of Rushville.

The affairs of the society are in a prosperous condition, and our annual fair and cattle show, with the exhibition of fruits, vegetables and mechanic arts, etc., give every encouragement, that our enterprise is favored by an appreciative community.

JOHN SAYRE,
Secretary.

February 1st, 1870.

SANDY CREEK, RICHLAND, ORWELL AND BOYLSTON.

It affords us much pleasure to state that our fair, held September 15th and 16th, 1869, was a success over any former year; the attendance was unusually large, the Hall of Industry was exceeding well filled, and so in every department.

Total receipts of the fair	$1,503 23
Balance on hand from former years	415 12
Amount of disbursements for premiums	1,087 05
Balance in hand of the treasurer	831 30

The society has voted to build some new buildings the coming year, to repair their track, and to improve and beautify the show grounds, and in view of the effort being made by the board of managers of the society, we can reasonably expect to see the society's grounds the finest in northern New York.

D. E. WILDS,
Secretary.

SANGERFIELD AND MARSHALL.

By cash on hand from 1868	$199 08
Receipts	469 55
	$668,63
Paid premiums	$265 25
Expenses	238 93
Balance	164 45
	$668 63

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SKANEATELES.

This society during the past year has simply sustained its organization, and held an annual fair. Our fair was held on the 12th and 13th of October, with the average success that attended last year's exhibition. It was carried out on the same plan, and was, perhaps, too much a mere copy of previous enterprise.

The following is the list of officers of the Skaneateles Farmers' Club, for 1870: President, Jedediah Irish; Secretary, C. B. Thorne; Treasurer, Wm. J. Townsend.

C. B. THORNE,
Secretary.

SUSQUEHANNA VALLEY.

The thirteenth annual fair of the Susquehanna Valley Agricultural Society was held at Unadilla on Wednesday, Thursday and Friday, October 6th, 7th and 8th, 1869.

The weather was fine on all three days of the fair, and as a consequence, there was a large turn-out of people and a good show of stock and articles. The entries were large, showing that in the eight towns embraced within the jurisdiction of the society (in Otsego, Delaware and Chenango counties), the farmers and others were alive to the importance of having a good display. An immense crowd of people congregated on the last day to listen to Solon Robinson, of the *New York Tribune*, who delivered an eloquent address, replete with practical suggestions and interesting facts for the farmer and others.

This society has done and is doing much good in this section of the State, and its influence is felt and seen in better farms, and better manner of farming, better stock and better everything in our rural home life.

GEORGE B. FELLOWS,
Acting Secretary.

SPENCERPORT.

Our meetings are held every Tuesday evening from October to June. Subjects discussed the last season were: How to grow wheat, corn, barley and oats, and keep our lands in good condition. Each crop occupied two or three evenings. The profits of keeping milch cows compared with grain growing, also, was discussed for two or three

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evenings. Also, the care of farm stock in the yard and stables during winter, etc.

The Sheep Shearing Association joined the Farmers' Club for a show and fair in May last, and the result was very satisfactory. Fellows and Pierce sheared from their buck (French Merino), one years' growth, thirty-three and one-fourth pounds unwashed wool. There was a very creditable show of sheep, among which was a pen of Cotswolds from the farm of Joseph Harris that attracted special attention. No address. No races.

The officers of the Sheep Shearing Association are: H. H. Goff, President; J. D. Harroun, Secretary.

The Sheep Shearing Association have held yearly meetings, fairs and shows for the last ten years which have generally been well attended, and a success.

Officers Spencerport, Monroe County, Farmers' Club. President, H. B. McClure; Secretary, C. S. Hiscock; Treasurer, Geo. W. Hiscock.

C. S. HISCOCK,
Secretary.

THORNHILL.

The officers of the Thornhill Farmers' Club of the county of Onondaga, report that during the year 1869, there has been held an agricultural fair at which premiums were given according to list.

Also, that the treasurer has received $275.45, and that the payments have been eighty-five dollars for premiums, and $152.04 for work, etc. That we have held meetings for general discussion of agricultural subjects.

The officers for the year 1870 are: David S. Church, President; S. S. Kneeland, Treasurer, and E. C. Cowles, Secretary.

E. C. COWLES,
Secretary.

TRENTON UNION.

The society embraces eight towns in Oneida county and six towns in Herkimer county.

The fair was held at Trenton fair grounds, September 21st, 22d, 23d and 24th. A good exhibition of stock and of mechanical implements for husbandry and the mechanic was presented.

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The new floral hall, eighty by twenty-five feet, two stories in height, was crowded to excess. The lower story with the vegetable products of the farmers, and the upper story with the handiwork of the ladies.

The address was to have been delivered by Hon. John C. Blue, of Deerfield, a successful farmer and prominent member of the society. Mr. Blue, however, having been stricken down by sickness, was unable to be present to the great regret of his numerous friends gathered on the occasion, In his absence, the services of Mr. H. R. Wait, agricultural editor of the Utica Herald, were fortunately secured, and he gave an interesting and instructive address, which was highly appreciated. Mr. Wait, although a young man (graduate of Hamilton college), has given very much attention to agriculture.

After some introductory remarks on the season and place, where were gathered so many to enjoy the annual harvest home, he proceded to the main topic of his discourse, "The Relation of Education to Agriculture."

The primitive condition of civilization ere knowledge and experience had been applied to the cultivation of the soil, the rude implements employed and the feeble results attained, were all contrasted with what is presented at present in human society, its comforts and enjoyments, especially in the field of agriculture, where science has entered and wrought such wonders in the saving of human labor by the introduction of machinery, in the chemical analysis of the soil and its preparation and adaptation to certain crops, their wonderful increase and perfection in consequence, in the increase and richness of fruits and flowers under modern culture, and other results strange and beautiful.

The bifurcated stick and modern plow, the scythe and mowing machine, sickle and reaper, hand-rake and horse-rake, the pitch-fork and horse-fork, and the tedder, the lever-press and screw-press in the cheese-room, and the old method of cheese making by the sweat and toil of farmers' wives and daughters, and the new and better way in cheese factories, were able and felicitously contrasted.

The labors of Davy, Humboldt and Liebig, and others, their illustrious compeers, and the obligations the world has been laid under to them, were mentioned and illustrated.

Education has wrought with agriculture in the achievement of glorious results. These foreshadow what may yet be accomplished, and will incite to higher achievements in agriculture.

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The farmer now understands that, in the exercise of his vocation, he has to deal with laws that are fixed and immutable, and that neither his success or his failures are to be attributed to the blind workings of chance. Nowhere is it more necessary to possess a knowledge of these laws than in this section of country, not because the soil is less fertile, but on account of the shortness of the seasons. It has been demonstrated that a thorough knowledge of the principles and laws of agriculture will enable the farmer to so hasten or modify the process of nature, as to aid him materially in the securing of his crops. For instance, it has been decided, by competent judges, that the application of scientific principles in the single matter of drainage, has resulted in an absolute gain to the farmers of New York and New England of two weeks time.

The press is gathering and scattering sound information among the people in reference to practical agriculture, and agricultural schools, especially the one so richly and generously endowed at Ithaca, are furnishing such an education to our young men as will make them scientific and practical farmers. Such an education they should have in order to reach the highest success in their calling.

In view of the great advances now being made in agriculture, in view of the unlimited field it offers for successful endeavor, in view of the ennobling character of the calling, our young men have every reason to regard husbandry as one of the most useful, pleasant and profitable occupations in which they can engage.

At the annual meeting of the Trenton Union Agricultural Society, held at the fair grounds in Trenton, January 29th, the following officers were chosen for the year 1870: M. A. Blue, President, North Gage; Storrs Barrows, Secretary, South Trenton; D. W. Rhodes, Treasurer, South Trenton.

Total amount of receipts in 1869	$2,294 36
Disbursements	2,817 70
Indebtedness of the society	523 34

The society has extended the lease of the fair grounds in Trenton for twelve years. They have built an agricultural hall eighty by twenty-five feet, two stories in height, together with out-houses, stands, pens, stalls, wells, etc. The track is one-half a mile.

STORRS BARROWS,
Secretary.

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ULYSSES, COVERT AND HECTOR.

At the last annual meeting of the Union Agricultural and Horticultural Society of Ulysses, Covert and Hector, the following officers were duly elected for the ensuing year: Warren Halsey, President; Truman Boardman, Treasurer; J. H. Biggs, Secretary; all of Trumansburgh.

The receipts for 1869 were	$902 50
Disbursements	791 99
Leaving a balance of	$110 51

J. H. BIGGS,
Secretary.

VERNON.

The society, during the summer of 1869, erected a fine and commodious building for exhibition purposes, and held their fair early in October, which proved a complete success. The local editor of one of our daily papers told me that he had attended most of the town fairs held in this section and he thought, all things included, we excelled in our exhibition any one that he had attended; and we trust that next month we shall show progress and have a better exhibition than ever before.

L. A. GRISWOLD,
Secretary.

WINFIELD.

Number of entries at the last annual fair of the Winfield Union Agricultural Society, held September 21st, 22d and 23d, 1869:

Horses	138
Cattle	25
Sheep and swine	13
Fowls	13
Grain and hops	19
Roots and vegetables	116
Fruit	120
Butter and cheese	12
Mechanical implements	18
Unspecified	30
Ladies' department	409
	973

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Balance in treasury as per last report	$360 76
Receipts since last report	878 90
	$1,239 66

EXPENDITURES.

Premiums paid or to be paid	$577 25
Expenses as per report	656 35
Balance in hands of the treasurer	6 06
	$1,239 66

P. HASLEHURST,
Secretary.

WESTMORELAND.

The annual fair of this society was held Wednesday, Thursday and Friday, September 22d, 23d and 24th, 1869, on the fair ground near the village of Hampton. The grounds are handsomely located, and a half mile track around them. The days were fine; the attendance large; the exhibition good, and in all respects it was a success.

The number of entries was 640.

Receipts for the fair	$585 44
Expenses of " "	534 00
Balance in treasury	$51 44

V. C. SMITH,
Secretary.

YORKTOWN.

I am happy to say the Yorktown Agricultural Society still lives; and its prospects to day are much brighter than ever before.

Since our last annual report, we have leased for the term of ten years, twelve acres of land beautifully located and admirably adapted to our necessities.

We have already put up a substantial building, and nearly completed a half mile track. This, with other necessary expenditures involved us somewhat, especially as we had but about two weeks in

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which to make all this preparation for our fair, which was held on the 29th and 30th of September, and the 1st of October.

The weather was propitious; the exhibition fine (unless I except the ladies' department), and the receipts satisfactory.

On the last day of the fair, C. C. North, Esq., of Sing Sing, N. Y., delivered an able and interesting address to an attentive audience.

Our annual meeting was held on the 17th of December, when the same officers were elected by ballot for the ensuing year.

The following is the treasurer's report:

Balance on hand from last year		$452 05
Received from gate tickets		581 75
members tickets		140 50
Other sources.....		50 00
		$1,224 30
Expenditures including premiums paid.....		981 78
Balance in treasury.....		$242 52

CONSTANT WHITE,
Secretary.

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ADDITIONS TO THE LIBRARY AND MUSEUM, 1869.

Reports of Agricultural and other Societies, &c.

Transactions of the Rhode Island Society for the encouragement of Domestic Industry, for the year 1868.

Monthly sheet of the Proceedings of the Boston Society of Natural History, pages 289 to 416, and index to vol. XII.

From C. L. Flint, Secretary, thirty volumes of the Sixteenth Annual Report of the Secretary of the Massachusetts Board of Agriculture, with an appendix containing reports of delegates appointed to visit the county exhibitions for 1868.

Report of the New Jersey State College for the benefit of Agriculture and the Mechanic Arts, for the year 1867, with the Agricultural Lectures for 1866–7–8. From George H. Cook, Ph. D., LL.D., Vice-President and Professor of Chemistry and Agriculture.

Report of Rockland County Agricultural Society for 1868, from Isaac C. House, Recording Secretary.

Fifteenth Annual Report of the Superintendent of Public Instruction of the State of New York, for 1868, from A. B. Weaver, Superintendent.

Twenty-five copies of the monthly reports of the Department of Agriculture, Washington, D. C., from the Hon. H. Capron, Commissioner.

Report of the Trustees of the New Hampshire College of Agriculture and the Mechanic Arts, to the Legislature, at the June session, 1869.

Transactions of the Berkshire (Mass.) Agricultural Society, for 1868; from John E. Merrill, Secretary, Pittsfield.

First Annual Report of the American Society for the Prevention of Cruelty to Animals, for 1867; from W. C. H. Waddell, Secretary.

Twelfth Annual Report of the Wilmington Institute, 1869; from Wm. A. Reynolds, Secretary.

Reports of the Secretary and Treasurer of the Maine State Agricultural Society for the year 1868; from Samuel L. Boardman, Secretary.

Transactions of the Rhode Island Society for the encouragement of Domestic Industry, for the years 1867 and 1868; Wm. F. Channing, Secretary and Treasurer.

First Annual Report of the Board of Trustees of the Illinois Industrial University; from their organization, March 12, 1867, to the close of the academic year, June 18, 1868.

Four copies of the Transactions of Illinois State Horticultural Society for 1868; from W. C. Flagg, Secretary.

Sixth Annual Report of the Trustees of the Massachusetts Agricultural College, 1869.

Fourth Annual Report of the American Dairymen's Association for 1868; embracing, also, the Annual Report of the Ohio Dairymen's Association for 1868.

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Michigan State Agricultural College report for 1868; from T. C. Abbott, President.

Jefferson County Agricultural Society. Transactions for 1868. From A. P. Sigourney, Secretary.

Indiana State Board of Agriculture. Transactions for 1868; five copies; from A. J. Holmes, Secretary.

Transactions of the Massachusetts Horticultural Society for 1868. Edwin W. Buswell, Corresponding Secretary, Boston.

Two copies of the Report of the Connecticut Board of Agriculture for 1866–7.

FOREIGN.

Journal of the Royal Agricultural Society of England; Vol. V, Parts I and II, Nos. IX and X, 1869. From the Society.

Journal of the Chemico-Agricultural Society of Ulster. Belfast, Nos. 3 and 4, Vol. 8, 1869. From Dr. J. F. Hodges, Secretary.

Agricultural Central Journal for Germany. Vol. XVII, 1869.

Ninth Report of the Offenbach Society of Natural History, from May 12, 1867, to May 17, 1868.

Weekly Journal for the Promotion of Horticulture in the Royal Prussian States, for Gardening and Botany. Berlin, edited by Professor Karl Koch. Twenty-three numbers, from July 18, 1868, to January, 1869.

Agricultural Journal of the Prussian Provinces, Konigsberg. Twenty-six numbers, from July 4th, 1868, to December 26, 1868.

Bulletin of the Imperial Society of Naturalists of Moscow. Vols. XLI and XLII, 1868 and 1869.

Journal of the Agricultural Society of New South Wales; Nos. VI and X. Sidney, 1869.

Monthly Journal of the Transactions of the (French) National Academy (Agricultural, Manufacturing and Commercial), and of the French General Statistical Society, for 1869.

Report of Public Accounts of Canada, for the fiscal year ended June 30, 1869, from Major L. A. Huguet Latour.

Report of Prof. S. W. Johnson, of the Sheffield Scientific School, made to the Connecticut Board of Agriculture, on Commercial Fertilizers, from T. S. Gold, Secretary.

Two copies Illustrated and Descriptive Catalogue of Agricultural Machinery, manufactured and sold by Ransomes, Sims & Head, Orwell works, Ipswich and 9 Grace Church street, London, England, 1869, together with fourteen photographs of buildings and grounds, and sixteen photographs of implements manufactured.

Two copies of the Report of the Ballarat Agricultural and Pastoral Society, Learmonth, Victoria, for the year ending May 1, 1869.

Report of the Delegates appointed by The Board of Agriculture of the Province of Ontario, to inquire into the causes, nature and extent of the Texan cattle disease. 1868.

The Journal of the Royal Horticultural Society of London. New Series; Vol 2. By the Rev. M. J. Berkeley, M. A., F. L. S., F. R. H. S. London, 1869.

The Canadian Naturalist and Quarterly Journal of Science, with the Proceedings of the Natural History Society of Montreal. By J. F. Whiteaves, F. G. S., etc.

Transactions of the Highland and Agricultural Society of Scotland for 1869.

Resume d'Agriculture Pratique, par demandes et responses ou Questionnaire

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Agricole; par J. Bodin. Also, Arithmetique Agricole, Theorique et Pratique a L'usage des Ecoles Primaires; par M. J. Henri Fabre. From Mr. J. L. Tappan, Paris.

Report of the Commissioner of Agriculture and Arts of the Province of Ontario for 1868.

From the Prussian Ministry of Agriculture. Dr. Meitzen's first volume on the Soil and Agricultural Condition of the Prussian States. 4to; pp. 551.

From the Royal Central Meteorological Institute of the Netherlands. The Meteorological Year Book for 1867, two vols., and Treatise on the Temperature of the Sea at the Surface, near the South point of Africa.

The Sixteenth Annual Report to the Council of the City of Manchester, England, on the working of the Public Free Libraries, 1867–8.

Proceedings of the Royal Horticultural Society, from August, 1868, to January, 1869. No. XII, Vol. I. New Series. From the Society.

PUBLIC DOCUMENTS, ADDRESSES, ETC.

From Hon. A. D. White, President. Catalogue of officers and students of the Cornell University for the academic year 1869, with an announcement of terms, course of study, etc.

Six copies (donor unknown) of Dr. G. Zehfuss' pamphlet (pp. 62) on "The Pneumatic Sewage System, treated with reference to Public Health, Agriculture and National Economy." Part I, translated, with an introduction to Captain Charles T. Liernur's Pneumatic Sewage System, by Dr. F. Coar, of Philadelphia, Pa.

Annual Report of the Superintendent of the Bank Department of the State of New York, for 1869; from G. W. Schuyler, Superintendent.

First Annual Report upon the Geology and Mineralogy of the State of New Hampshire. By C. H. Hitchcock, State Geologist, and Hall Professor of Geology and Mineralogy in Dartmouth College. Manchester, N. H., 1869.

Annual Report of the State Engineer and Surveyor, on the Canals of New York. 1869.

Journal of Social Science, containing the Transactions of the American Association. No. 1, June, 1869. From Thomas Cowell, Albany.

Annual Address, by A. M. Clapp, before the Lenox Farmers' and Mechanics' Association, Canastota, Madison county, 1868.

Sixth Annual Report of the Department of Agriculture, Washington, D. C. 25 copies. From Hon. H. Capron, Commissioner.

Report of the Majority of the United States Senate Committee on the Pacific Railroad. From Hon. F. E. Woodbridge, M. C., of Vermont.

Annual Report of the Board of Regents of the University of Wisconsin, for the year ending September 30, 1868.

First Annual Report of the Superintendent of the Eastern Pennsylvania Experimental Farm, and programme for future experiments.

LIBRARY.

Five volumes of Transactions of the New York State Homœopathic Society's Report for 1868. (Exchange) from H. M. Paine, M. D., Secretary.

Twelfth Annual Report of the Board of Commissioners of the Central Park, New York; 164 pages, illustrated; from Andrew H. Green, Secretary.

Sixteen volumes of Transactions of the New York State Agricultural Society; from John W. Chambers, Librarian American Institute.

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Thornton's Circular. A Record of Short-Horn Transactions and Catalogue of Short-Horn Cattle for private sale, 1869. John Thornton, 15 Langham Place, London, W.

Devon Herd Book. Vol. V, 1869. By J. Tanner Davy, Rose Ash, South Molton, Devon, England; from the author.

The Stock Feeders' Manual, "The Chemistry of Food in relation to the breeding and feeding of Live Stock." By Charles A. Cameron, Ph. D., M. D., Professor of Hygiene in the Royal College of Surgeons and of Chemistry in Stevens' Hospital and Medical College, Dublin; one of the Editors of the Irish Farmers' Gazette, etc., etc.; from the author. 16mo; 254 pp. Published by Cassell Petter & Galpin, London and New York.

From the Boston Society of Natural History: Entomological Correspondence of Thaddeus W. Harris, M. D. Edited by Samuel H. Scudder, and published by the Society. Also Memoirs read before the Boston Society of Natural History. Vol. I, Part IV; 1869.

Geology of New Jersey; 1868. By Geo. H. Cook, Geologist. With maps. From Professor Cook.

A copy of Agricultural Transactions as compiled by Mr. James Le Ray de Chaumont, with his autograph on fly-leaf. Containing remarks addressed to the Jefferson County Agricultural Society at their semi-annual meeting in March, 1820, by Le Ray de Chaumont, President. Address delivered before the Jefferson County Agricultural Society, September, 1829, by J. Le Ray de Chaumont, President, and an abstract of the viewing Committee's Report. Address before the Jefferson County Agricultural Society at the Annual Cattle Show, September, 1830, by V. Le Ray de Chaumont. Address before the Jefferson County Agricultural Society at the Annual Cattle Show and Fair, September, 1831, by Major Edmund Kirby; and Proceedings of the State Agricultural Convention held at Albany, February 14, 15 and 16, 1832.

Prairie Farmer and Agricultural and Horticultural Advertiser. Chicago, 1869.

MUSEUM.

Engraved Portrait of Henry George Francis, Earl Ducie; from B. W. Johnson, Albany.

Engraving of the Ketton Ox; from B. W. Johnson, Albany.

From M. A. Nicholls, Lockport. Fine imported Duck wing Game Cock (dead), stuffed and placed in the Museum.

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